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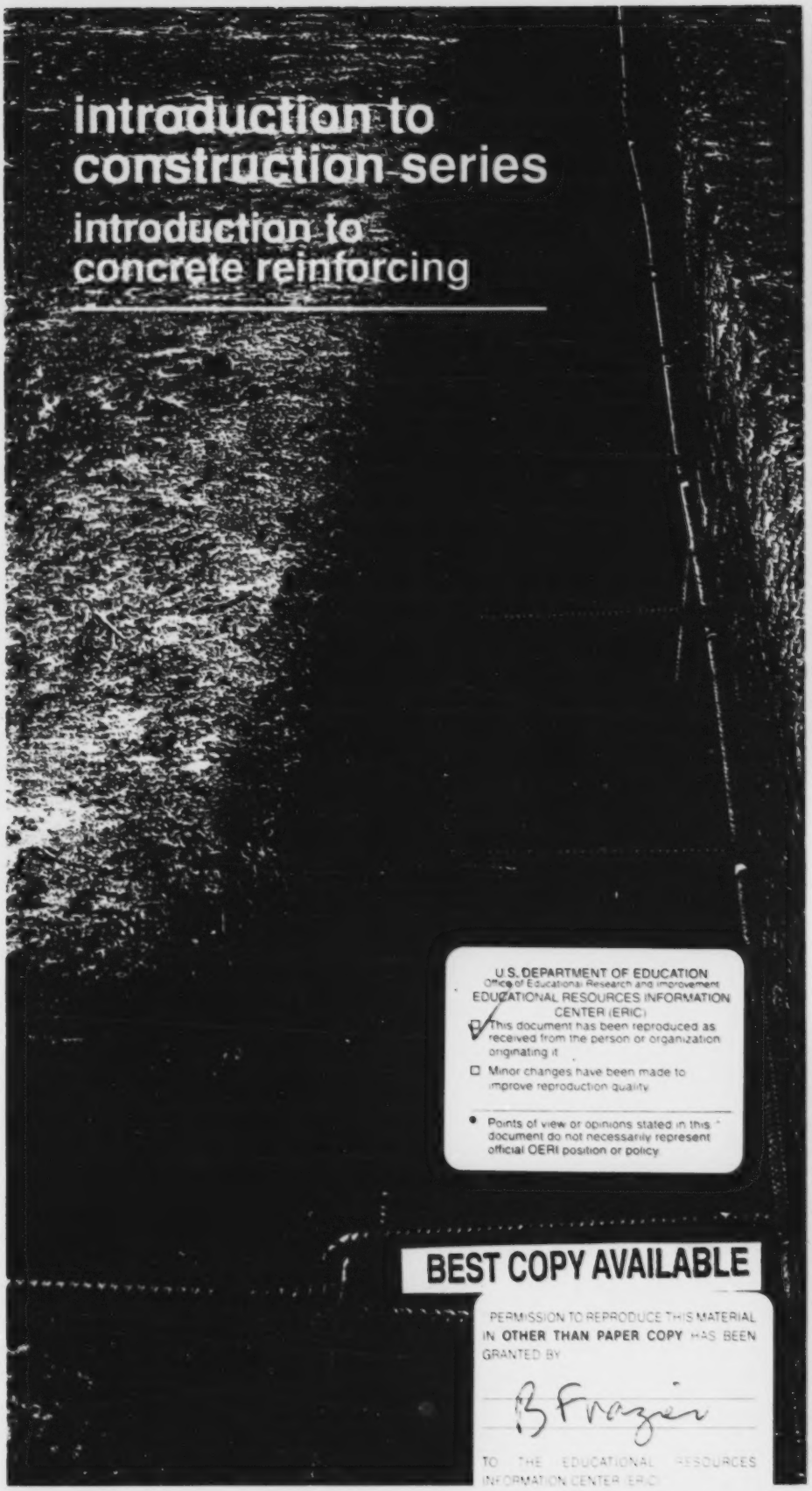
ABSTRACT

This instructor's guide contains the materials required to teach a competency-based introductory course in concrete reinforcing to students who have chosen to explore careers in construction. It contains three units: concrete reinforcing materials, concrete reinforcing tools, and applied skills. Each instructional unit includes some or all of the basic components of a unit of instruction: performance objectives, suggested activities for the instructor, extensions and options, information sheets, student supplements, transparency masters, instructional supplements, assignment sheets, job sheets, practical tests, written tests, and answers to assignment sheets and written tests. Academic skills training is combined with vocational training throughout the instructional materials, and a system of icons has been used to help instructors identify activities into which training in the following basic skill areas has been infused: reading, science, creative thinking/problem solving, writing, oral communication, employability, math, interpersonal skills, and social studies. Most units of instruction are designed for use in more than one lesson or class period of instruction. These materials precede the instructional units: information on basic skills in curriculum, information on measuring student performance gains, and required criteria for a competency-based education program. A basic skills documentation matrix and competency profile are provided. (YLB)

ED 385 684

# introduction to construction series

## introduction to concrete reinforcing



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# Introduction To Concrete Reinforcing

Developed as a Cooperative Project by
the Associated General Contractors of America
William W. Brown, Chairman, Manpower and Training Committee
and
Curriculum and Instructional Materials Center,
Oklahoma Department of Vocational and Technical Education

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Introduction To Concrete Reinforcing

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## FOREWORD

In 1985, The Associated General Contractors of America (AGC) met with representatives of the Oklahoma Curriculum and Instructional Materials Center (CIMC) to discuss the possibilities of developing, as a cooperative project a course of instruction designed for training individuals who choose to seriously explore careers in construction.

This revised publication is the result of those original discussions and updates made through close coordination among general contractors and vocational educators. This series represents conscious effort to coordinate the practical experience of personnel in the carpentry industry with the best instructional methods of those in the field of vocational education.

Although this book reflects a systematic approach to instructional materials development and the latest in educational technology innovations, the information in the Introduction To Sheet Metal manual should be adapted and modified to coincide with local conditions.

Roy Peters, Jr.
State Director
Oklahoma Department of Vocational
and Technical Education

William. W. Brown, Chairman
Manpower and Training Committee
The Associated General Contractors
of America

## PREFACE

Construction requires that students have many skills and related information to become productive workers in this challenging field. Workers must be better trained and equipped to find and retain meaningful employment.

Instructional materials in this manual is written in terms of student performance, using measurable behavioral learning process. Criterion-referenced evaluation instrument provide for a uniform measurement of student progress.

The purpose of this manual is to assist instructors in all construction related areas in providing instruction throughout the industry. Any information in this manual that does not concur with the instructor's course of study should be modified to meet personal needs.

Personnel safety is of prime concern, as an instructor you are encouraged to closely observe and couch students in all safety issues. We have done much to advise students of possible dangers, but your close supervision and alertness can't be overemphasized.

Al Willey
Curriculum and Instructional
Materials Center
Oklahoma Department of Vocational
and Technical Education

**ACKNOWLEDGEMENTS**

Much appreciation is expressed to the many individuals who contributed their time, talents, and knowledge in the revision of this manual.

Thank you to the following ad hoc committee members, AGC staff representatives, and the staff of the Oklahoma Department of Vocational and Technical Education.

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## USE OF THIS PUBLICATION
## INSTRUCTIONAL UNIT

***Introduction to Concrete Reinforcing*** contains three units. Each instructional unit includes some or all of the basic components of a unit of instruction: performance objectives, suggested activities for the instructor, extensions and options, information sheets, students supplements, transparency masters, instructional supplements, assignment sheets, job sheets, practical tests, written test, and answers to assignment sheets and written test, all of which are included in the instructor's edition. The student workbook includes the objective sheets, information sheets, student supplements, transparency masters, assignment sheets, and job sheets. Written tests may be duplicated for classroom use or *additional copies* may be purchased by calling 1-800-654-4502 or, in Oklahoma, 1-800-522-5810, ext. 589.

All of the unit components tie into measurable and observable learning outcomes. Instructors are encouraged to supplement these components with other resources in order to make them as responsive to local conditions and individual needs as possible.

Most units of instruction are designed for use in more than one lesson or class period of instruction. Careful study of each unit of instruction by the instructor will help him or her determine the following:

- Amount of material that can be covered in each class period.
- Skills that must be demonstrated.
  - Supplies and equipment needed
  - Amount of class time needed for demonstrations
  - Amount of time needed for student practice
- Supplementary materials, including print and non-print media, that must be ordered.
- Resource people who must be contacted.

**Objective Sheet** (White Pages)

Each unit of instruction is based on the performance needed for successful employment in an occupational area. Performance objectives are stated in two forms. The unit objectives states the overall goal of the unit. It tells what the student should be able to do and what standard will be used to see whether the student can do it. Specific objectives outline the teaching sequence of the competencies required to meet the unit objective.

The objectives should be provided for students and stressed throughout the teaching/learning process. This will help answer any questions concerning performance requirements for each instructional unit. The objectives can also help determine teaching strategies and instructional methods. Instructors should prepare for each unit by deciding how each objective could be best taught.

Instructors should feel free to modify, delete, or add objectives in order to meet the needs of the students and community. When objectives are added, the instructor should remember to supply the needed information, assignment and/or job sheets, and criterion-referenced test items.

**Suggested Activities** (Pink Pages) – **Instructor's Edition only**

The suggested activities page assists the instructor during the preparation stage of the teaching/learning process by providing suggestions for delivery, application, and evaluation during the instructional process. The instructor should read the suggested activities prior to introducing the unit to allow time to obtain supplemental materials, prepare audiovisual materials, and contact outside resources. Duties of the instructor will vary according to the particular unit.

References used in the development of each unit are listed in the "Suggested Resources" section, along with print and non-print media that may be used to teach the unit. These materials can be used by the instructor to supplement his or her knowledge of the subject area or to help students with particular interests or occupational objectives in the area covered.

**Extensions and Options** (White Pages) – **Instructor's Edition only**

Extensions and Options are supplemental material that is not testable or graded and is nice-to-know. Extensions and Options provide the instructor with additional activities, fact sheets, art, controversial items, and extra practice sheets. They may also include items for the gifted or remedial student. Extensions and Options are used at the discretion of the instructor.

**Information Sheets** (Green Pages)

The information sheet provides "must know" content essential for meeting the cognitive objectives stated at the beginning of each unit. It serves as an excellent guide for presenting background knowledge necessary to develop the skills specified in the unit objective.

Students should read the information sheet before it is discussed in class. Space is provided in margins for students and instructors to add notes that clarify and/or expand on the information provided.

The information sheet may include notes, cautions, or warnings. These should be discussed carefully and thoroughly. **Notes** are short verbal additions to the information sheet or procedural outline that provide nice-to-know and decision-making information. A note may tell the student what to watch for or to consider at a given step. It may explain when a step may not be applicable. Notes offer guidance that may help the student understand the process and do it more efficiently. **Cautions** are advisories that tell the student how to avoid causing minor personal injury or equipment damage. **Warnings** are advisories to the student used to avoid serious personal injury or death to the student, persons in the workplace, or users of the project or the procedure.

**Student Supplement** (Green Pages)

Student supplements include instructions that could be used for solving problems or reinforcing the enrichment of learning. The information presented in a student supplement may consist of tables, charts, written information, forms, or other information students will need in order to complete one or more of the assignment or job sheets. While supplements are not tested over directly, they may be used to assist in meeting the performance objectives.

**Transparency Masters** (White Pages) - **Instructor's Edition only**

Transparency masters provide information in a special way. The students may see as well as hear the materials being presented, thus reinforcing the learning process. Transparencies may present new information or they may reinforce information presented in the information or assignment sheets.

Transparencies should be made and placed in the notebook where they will be immediately available for use. Transparencies direct the class's attention to the topic of discussion. They should be left on the screen only when topics shown are under discussion.

**Instructional Supplements** (Pink Pages) — **Instructor's Edition only**

Instructional Supplements provide suggestions for teaching the basic skills included in each assignment sheet or job sheet. They are located directly in front of the components they support—assignment or job sheets—in each unit.

**Assignment Sheets** (Tan Pages)

Assignment sheets provide students with information and exercises that address learning levels at or above the application level of Bloom's taxonomy. Assignment sheets provide written exercises for instruction and practice of a specific objective. The introduction to the assignment sheet explains how the assignment sheet relates to the subject area and unit component for such information.

**Assignment Sheet Answers** (Pink Pages) – **Instructor's Edition only**

This component is designed to assist the instructor in evaluating student performance on assignment sheets.

**Job Sheet** (Blue Pages)

Job Sheets are another important segment of a unit of instruction. The job sheets provide a list of equipment, tools, and materials needed to complete a manipulative or psychomotor skill. They describe a step-by-step procedure to complete each task or job. Diagrams, photographs, and illustration are provided to assist students in achieving the skill.

The instructor should demonstrate the procedure outlined in each job sheet. Furthermore, the instructor needs to localize the procedure according to the equipment and supplies available in the local lab or salon situation. Job sheets also furnish potential employers with a picture of the skills being taught and the performances they might reasonably expect from a person who has had this vocational instruction.

**Practical Tests** (Yellow Pages) – **Instructor's Edition only**

The practical tests are designed to assist the instructor in the evaluation of the psychomotor activities (job sheets). The practical test provides instructors with a valid mechanism for determining a student's level of ability in performing the procedure stated on the job sheet. The check-off list allows instructors to evaluate a student's process performance of the task on the job sheet. The overall competency indicator allows the instructor to evaluate the end product.

**Written Test** (Yellow Pages) – **Instructor's Edition only**

This component provides criterion-referenced evaluation of every objective listed in the unit of instruction. If objectives have been added, deleted, or modified, appropriate changes should be made on the test.

In order to measure and document student competency gains as required by the latest Carl Perkins regulations, and as outlined in the Oklahoma-developed system of standards and measures, it is *absolutely essential* that the same test be used as a pretest and as a posttest. If you choose to use tests other than the ones included herein, be sure that the same instrument is used for each activity–pre- and post test.

A detailed explanation of the Oklahoma plan for standards and measures and the Carl Perkins requirements is included in the CIMC publication, *Measuring Learning & Competency Gain: The Pretest/Posttest Approach.* This booklet and accompanying software designed to assist in calculating and recording student gains are available to all vocational teachers through the school's vocational testing liaison.

To further assist vocational teachers, the CIMC is in the process of developing test code sheets for each written test in its more recent publications, including this one. These code sheets are explained in Section 8 of the publication mentioned above, and will greatly assist in verifying that the test is a valid instrument for measuring student learning and competency gains. As the test code sheets for programs become available, they will be forwarded to teachers of each program; further publications will include the test code sheets.

**Written Test Answers** (Pink Pages) – **Instructor's Edition only**

This component is designed to assist the instructor in evaluating student performance on written tests.

## COMPETENCY PROFILES

A competency profile is in the front of each publication. Competency profiles document student performance. The profile contains a list of the specific job competencies that a student should achieve before leaving the training program.

## PAGE NUMBERING

Each publication for the Curriculum and Instructional Materials Center is usually assigned a specific abbreviation. ***Introduction to Concrete Reinforcing*** has not been abbreviated. Each unit will be recognized by the unit number in Arabic numerals. Each unit in the publication begins with page 1. Each page number gives the component name, book title, unit number, and page number within the unit. Since some CIMC publications are loose-leaf, this system of page numbering was recently adopted so that pages from different manuals would not get mixed up. The page number for the objective sheet in Introduction to Sheet Metal, which is unit 2, would look like this:

OBJECTIVE SHEET - **Introduction to Concrete Reinforcing**
**CIMC** - A2 - 1

## METHODS OF DISSEMINATING MATERIAL

For best results, provide student materials for each student. Student workbooks contain objective sheets, information sheets, supplements, transparency masters, assignment sheets, and job sheets. Pretest, practical tests, and written tests are packaged separately for students, and can be stored until needed. Students should be allowed to take their materials home at the end of the course.

**TEACHING METHODS**

Keeping students motivated is a challenge. Supplement the objectives by providing the "why," personal experiences, and current information. If you are going to teach the material in a group setting, prepare for the unit be deciding the best way to teach each objective and allow for student input.

If you are going to follow the plan for individualized instruction, provide opportunities that will allow each student to become involved in planning for and being responsible for his or her own education.

## CORRECTIONS AND SUGGESTIONS

The Curriculum and Instructional Materials Center (CIMC) wants to provide vocational instructors and students with materials that are accurate and effective. Although the CIMC strives to maintain the highest standards of development and production, oversights occasionally do occur. If you find any errors in this or other CIMC publications, or have suggestions for improving their usefulness in vocational programs, please notify the CIMC staff. One easy way of pointing out errors is to make a photocopy of the affected page and to indicate the correction on the copy. Mail this information to the CIMC, where it will be used to correct the publication before the materials are reprinted.

To ensure that the material is updated on a timely basis, notify the CIMC of necessary corrections as soon as possible after discovering the error. Do not assume that someone else will notice the error and inform the CIMC; other users may be making the same assumption. Please send corrections and recommendations for improving this publication to the following address:

Coordinator of Development
Curriculum and Instructional Materials Center
Oklahoma Department of Vocational and
Technical Education
1500 West Seventh Avenue
Stillwater, Oklahoma 74074-4364

**For a free catalog, a list of new publications, or other instructional materials information call 1-800-522-5810, extension 589.**

RESALE

## BASIC SKILLS IN CURRICULUM

The CIMC has always been mindful of the importance of reinforcement (and sometimes remediation) of students' academic skills as they progress through vocational training, and has always included activities in its materials to enhance and promote use of these skills.

Recent state and federal legislation mandates vigorous basic skills development in vocational education in the wake of demands by industry that workers *must* be academically, as well as technically, competent, given the nature of the highly complex work place. In response, the CIMC has taken the following steps to document that, indeed, the instructional materials *do* combine academic skills training with the vocational training. In addition, concerted efforts have been made to "beef up," or enhance the basic skills instruction already present. Following is a brief description of those processes:

### *Basic Skills Icons and Enablers*

To assist teachers and students in identifying activities that promote basic skills development, the CIMC has implemented a marking system that uses simple graphic symbols, or icons, and a list of specific tasks, or enablers, to identify the basic skill or skills that are called for in each job or assignment sheet.

Each of the nine broad skills areas—reading, writing, mathematics, science, oral communication, interpersonal or relating, creative thinking and problem solving, employability, and social studies—is represented by the icon presented below.

Reading

Science

Creative Thinking/ Problem Solving

Writing

Oral Communication

Employability

Math

Interpersonal or Relating

Social Studies

When an activity involving one of these basic skills is identified, the corresponding icon is placed in the left-hand margin of the job or assignment sheet. The basic skills training is further defined by retrieving the specific, or enabling, skill that is required by consulting a list of over two hundred and fifty enablers that has been compiled and grouped with each general basic skill. This enabling skill is placed directly below the icon.

As an example, an exercise that requires a student to conduct library research would make necessary the use of specific reading comprehension and research and reference skills. The basic skills that the exercise promotes would be depicted in the left-hand margin as follows:

**ASSIGNMENT SHEET** | ***PLANNING LIVING SPACE FOR HUMAN NEEDS*** | **1**

Name _____ Score _____

**OBJECTIVE 10** **Define personal territory.**

**INSTRUCTIONS**

Reading Comprehension
- Gain factual information

Functional Reading
- Follow written instructions
- Use content area vocabulary

Language
- Use standard grammar, spelling, and capitalization
- State ideas clearly

- As discussed in Objective 1, each person has an invisible "space bubble" or comfort zone. A comfort zone is the space between oneself and others that brings a feeling of well-being. When one's comfort zone is crowded or invaded, discomfort often results. Therefore, personal territory needs should be a prime consideration when planning living space.
- For each of the following situations, draw your estimated comfort zone around the figures provided.
- Indicate how many inches from your body the comfort zone extends.
- Consider how that comfort zone changes in different situations. Answer the questions that follow.

### *Basic Skills Documentation Matrix*

Another component of the CIMC basic skills instructional plan is the "Basic Skills Documentation Matrix." The matrix graphically summarizes the basic skills training included in the vocational program, unit by unit. It should be helpful to teachers in planning their instruction, and to administrators as documentation that basic skills **are** being addressed during the vocational training.

The matrix for this publication is included as an 8½" by 11" foldout in this *Instructor's Manual.*

Matrices have been developed for most CIMC publications. For more information on those available for other programs, call the CIMC at 1-800-654-4502.

### *Instructional Supplement*

The supplement is a tool for the instructor to use in helping students apply the basic skills in Assignment Sheets and Job Sheets. Some supplements are appropriate for use with all students; some are for use only with those students who do not understand the academic skills called for in the exercise.

## MEASURING STUDENT PERFORMANCE GAINS

When you examine this book, you will notice that separate written pretests are no longer included in the units of instruction. Each CIMC unit now contains only a single Written Test. This test should be used as **both** pretest and posttest by giving it once before students start a unit and again when they have completed the unit.

The reason for using a single instrument as both pretest and posttest is so that direct comparison of each student's competencies before and after instruction can be made accurately. This comparison enables precise calculation, documentation, and evaluation of student **performance gains**.

Accurate performance gains analysis is an important requirement of the new Carl Perkins legislation for vocational education. Teachers can make an important contribution to the performance accountability mandated by the new federal legislation by carrying out accurate performance gains analysis for their students, and making this data available to students, parents, and administrators.

This analysis is easy to do and requires only simple calculations and record keeping. Detailed information regarding performance gains analysis is contained in the CIMC publication, *Measuring Learning & Competency Gains: The Pretest/Posttest Approach.* In addition, the CIMC has developed a computer program, CARL, which will perform all necessary calculations and will print out a record form of all information required for gain score analysis. Copies of CARL and the publication are available through your local testing liaison (in Oklahoma), or from the CIMC at 1-800-654-4502.

## REQUIRED CRITERIA FOR A COMPETENCY-BASED EDUCATION PROGRAM

| Criterion | Discussion | CIMC component meeting criterion |
|---|---|---|
| **1. Instruction is based on clearly-stated learning objectives that are: a) observable and measurable, and b) communicated in writing to students before instruction begins.** | Learning objectives drive CBE. Objectives are the "competencies" that learners must achieve. Each objective must clearly state what *learners* must *do* to demonstrate acquired skill or knowledge. Verbs in learning objectives are active and precise, stating the exact performance expected of learners. The objectives should also specify the standard or level of performance required. Objectives can be at any level of Bloom's Taxonomy and can include the cognitive, psychomotor, and affective domains. Higher-order cognitive skills should be included. | Objective Sheet |
| **2. Instruction is aligned with the stated learning objectives** | In CBE, the objectives specify what is taught. "Content" should relate to one or more objectives. The curriculum should cover all objectives with relevant information. | Information Sheet |
| **3. There is a student evaluation system that is: a) criterion-referenced, and b) aligned to the learning objectives and the curriculum.** | In CBE, the aim is to bring the performance of *all* learners up to a pre-defined standards and competencies. Learners work on each competency until they achieve "mastery"; the evaluation system should test and record this mastery. Learners can restudy and retest as often as needed. Specific remediation activities should also be available to learners when needed. The evaluation system focuses on what each student has achieved, not on what the instructor has "taught." The "constant" in CBE is student performance; the "variables" are time and resources. (This differs from traditional systems where learners get one chance at mastery; some succeed and some fail. In such systems, time and resources are constant and student achievement is variable.)<br><br>If an evaluation is criterion-referenced, successful learner performance is defined by (or *referenced* to) mastery of pre-set objectives and standards (or *criteria*): there must be a careful match (or *alignment*) between what the student should master (objectives), what is taught (curriculum), and what is tested. Objectives, curriculum, and evaluation system must all match. | Written Test and Job Sheet/Skill Test |

| Criterion | Discussion | CIMC component meeting criterion |
|---|---|---|
| **4. There is an observable management system of cognitive skill practice that provides for, promotes, and documents mastery learning.** | For both cognitive and psychomotor skills, a CBE program must have a system of maintaining records of which skills and activities each learner has completed, which ones are in progress, and which ones have not yet been completed. Completion means "mastery"; no skill is completed until the learner has achieved the mastery level.<br><br>The record system should promote feedback on student skill attainment to *both* instructor and learners, provide for remediation as needed, and encourage reevaluation of learner performance until mastery is achieved. Appropriate remediation strategies often should consider learning styles and other individual differences among learners.<br><br>Learners should work on skills and activities until they achieve mastery. They should not be "passed on" without mastery. While learners may move ahead and work on other skills (i.e those for which all prerequisite skills have been mastered or those without prerequisites), work should also continue on the skills still requiring mastery. Students should not attempt higher-order skills until all prerequisite skills are mastered. | Assignment Sheet |
| **5. There is an observable management system of psychomotor skill practice that provides for, promotes, and documents mastery learning.** | | Job Sheet/Skill Test |
| **6. Skill mastery records are maintained for each learner, and learners have access to and make use of these records to monitor their skill acquisition.** | Records should clearly indicate the skills each learner has mastered. One such record should profile or list the competencies that have been mastered and those to be mastered. Other performance indicators can be added and kept in a portfolio for each learner. Learners should have ready access to their portfolios to monitor their own progress in skill mastery and competency attainment. | Competency Profile |

## CORRECTIONS AND SUGGESTIONS

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This information will be used to correct the publication before the materials are reprinted. To ensure that the material is updated on a timely basis, notify the CIMC of necessary corrections as soon as possible after discovering the error.

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| OBJECTIVE SHEET | CONCRETE REINFORCING MATERIALS — A I |
|---|---|

**INTRODUCTION**

Concrete reinforcing has greatly increased the strength and expanded the uses of concrete. The materials designed for reinforcement include reinforcing bars, welded wire fabric, and fiber mesh.

Understanding concrete reinforcing will prepare you to assist in the construction of strong and safe concrete structures.

**PREREQUISITE**

*Fundamentals of Construction*

**UNIT OBJECTIVE**

After completing this unit, the student will be able to identify the types of concrete reinforcing. The student will demonstrate these competencies by completing the assignment sheets and written test with a minimum of 85 percent accuracy.

**SPECIFIC OBJECTIVES**

After completing this unit, the student will be able to show the ability to:

1. Given a list of terms associated with materials used in concrete reinforcing, match them to their correct definitions.
2. Interpret the numeric identity for common sizes of welded wire fabric rolls and sheets.
3. Given illustrations, select the titles of hardware accessories used to install reinforcing bars.
4. Given drawings, match reinforcing bar supports to their proper titles. (Assignment Sheet 1)
5. Given drawings with identification markings, write in the specifications of standard reinforcing bars. (Assignment Sheet 2)

| SUGGESTED ACTIVITIES | CONCRETE REINFORCING MATERIALS A I |
|---|---|
| PREPARATION | • Review unit and plan presentation.<br>• Order or obtain materials to supplement unit.<br>• Introduce unit. |
| DELIVERY | **Objective 1: Given a list of terms associated with materials used in concrete reinforcing, match them to their correct definitions.**<br>• Use Information Sheet to introduce students to the terms and definitions associated with concrete reinforcing materials.<br>• Show students samples of appropriate terms.<br>**Objective 2: Interpret the numeric identity for common sizes of welded wire fabric rolls or sheets.**<br>• Show students samples of different sizes of welded wire fabric.<br>**Objective 3: Given illustrations, select the titles of hardware accessories used to install reinforcing bars.**<br>• Discuss the importance of proper installation of reinforcement and maintaining the proper placement of it in the concrete; also discuss the proper concrete coverage over the reinforcing steel.<br>• Use vendor catalogs to show the various types and uses of rebar accessories.<br>• Show both safety videos for hand and foot protection.<br>• Display samples of different types of splices.<br>• Discuss reasons for making splices. |

- Demonstrate procedures for making splices, then have the students demonstrate the procedures.

**APPLICATION**

**Objective 4: Given drawings, match reinforcing bar supports to their proper titles.** (Assignment Sheet 1)

- Display samples of different types of supports.
- Give the students the opportunity to look at and handle the various types of supports.
- Demonstrate the use of the supports and discuss their use.
- Discuss how the use of the supports is determined by the placement of the reinforcing bars and how the supports determine the amount of concrete coverage on the rebar.
- Allow students to practice recognition of supports by completing Assignment Sheet 1.

**Objective 5: Given drawings with identification markings, write in the specifications of standard reinforcing bars.** (Assignment Sheet 2)

- Discuss where and why these different sizes of reinforcing are used and how the size used depends on the required strength the concrete is designed to carry. Use Transparency 1 to supplement your discussion.
- Explain that all reinforcing must be clean, free from mud, oil, and other nonmetallic coatings that may affect bonding capacity at time concrete is placed.
- Allow students to practice the identification of rebar by completing Assignment Sheet 2.

**EVALUATION**

**Pretest**

- Give written test as pretest.
- Determine individual study requirements from pretest results.

- Counsel students individually on pretest results and study requirements.
- Modify materials in unit or create supplementary materials for individual students as required.

**Skill Test**

- Evaluate students on assignment sheet activities.
- Complete appropriate section of competency profiles.
- Reteach and reevaluate if necessary.
- Modify materials in unit or create supplementary materials for individual students as required.

**Written Test**

- Explain to students that they will be asked to demonstrate on the written test actions listed in the specific objectives.
- Give the written test.

  **NOTE:** The written test may be given in sections if desired.
- Complete appropriate section of competency profiles.
- Reteach and retest if necessary.
- Review individual and group performance in order to evaluate teaching methods. Adjust scope, sequence, or instructional approaches for additional lessons as required.

**SUGGESTED RESOURCES**

**Print Media**

- Cadweld Rebar Splicing. Supplement to Rebar Splicing Catalog. No. CRS 31249. Cleveland, Ohio: ERICO Products Inc.
- Dowel Bar Substitution. BD-SAE Splicer System. Ft. Worth, Texas: Richmond Screw Anchor Co.

**Electronic Media**

- Hand Protection*
- Foot Protection*

*Both are available in video form - AGC of America, 1957 E. Street N.W., Washington, DC 20006.

**UNIT REFERENCES**


- Toenjes, Leonard P. *Building Trades Dictionary*. American Technical Publishers, Inc.: Homewood, IL, 1989.
- Willey, Al. *Commercial Carpentry*. Stillwater, OK: Oklahoma Department of Vocational and Technical Education/Curriculum and Instructional Materials Center and The Associated General Contractors of America, 1993.

| INFORMATION SHEET | CONCRETE REINFORCING MATERIALS A I |
|---|---|

OBJECTIVE 1

**Given a list of terms associated with materials used in concrete reinforcing, match them to their correct definitions.**

- **axle steel** — very hard carbon-steel used to make rebar
- **billet steel** — semi-finished steel used to make rebar
- **diameter** — the distance across a circular figure at its center point
- **double strong** — two thicknesses of tie wire
- **fiber mesh reinforcement** — metal, nylon, or plastic strands added to concrete to improve its tensile strength
- **pig-tails** — manufactured, precut lengths of wire ties that are formed with small loops at each end
- **PSI or psi** — pounds per square inch
- **rail steel** — hardened steel used to make rebar
- **rebar supports** — formed wire devices, used to support, hold and space reinforcing bars
- **reinforcing rod (rebar)** — deformed steel bar added to concrete to increase its tensile strength
- **tensile strength** — capacity for resisting a bending, stretching, or twisting force
- **welded wire fabric** — steel used to reinforce concrete by welding wires together in a grid pattern
- **wire ties** — metal wire used to fasten reinforcing rods or wire fabric together

OBJECTIVE 2

**Interpret the numeric identity for common sizes of welded wire fabric rolls and sheets.**

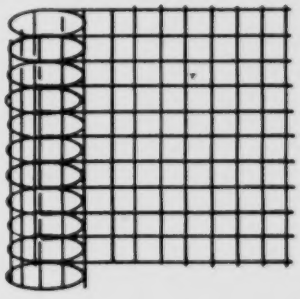
- Common sizes of welded wire fabric

  — Rolls

  Rolls of welded wire fabric is manufactured 5 feet wide by 150 feet long which is 750 square feet; usually used in flat concrete work such as floor slabs, pavements, sidewalks, and such. The first two numbers indicate the spacing of the steel. 6 × 6 means the steel is spaced six inches apart both ways. The second two numbers indicate the size (diameter) of the steel fabric. W1.4 means the steel is 10 gauge, W2.0 is 8 gauge, W2.9 is 6 gauge, W4.0 is 4 gauge, and W5.5 is 2 gauge.

  1. 6 × 6 - W 1.4 × w 1.4
  2. 6 × 6 - W 2.0 × 3 2.0
  3. 6 × 6 - W 2.9 × W 2.9
  4. 6 × 6 - W 4.0 × W 4.0
  5. 4 × 4 - W 1.4 × W 1.4
  6. 4 × 4 - W 2.0 × W 2.0
  7. 4 × 4 - W 2.9 × W 2.9
  8. 4 × 4 - W 4.0 × W 4.0

**FIGURE 1**



  — Sheets (mats)

  **NOTE:** Sheet welded wire fabric is manufactured 8 feet wide by 20 feet long which is 160 square feet.

  1. 6 × 6 - W 2.9 × W 2.9
  2. 6 × 6 - W 4.0 × W 4.0
  3. 6 × 6 - W 5.5 × W 5.5

4. 4 × 4 - W 4.0 × W 4.0

5. 4 × 4 - W 5.5 × W 5.5

OBJECTIVE 3

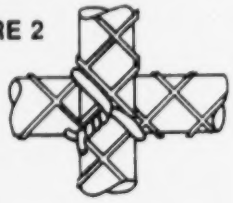
**Given illustrations, select the titles of hardware accessories used to install reinforcing bars.**

- Wire ties

**NOTE:** 16 gauge, black annealed wire or wire pigtails are used to make the ties below. Although it may be difficult to see below, each tie end is twisted 3 to 4 twists.

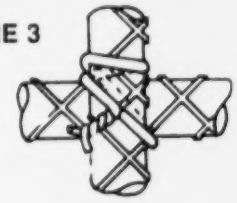
— Single tie (snaptie)

**FIGURE 2**



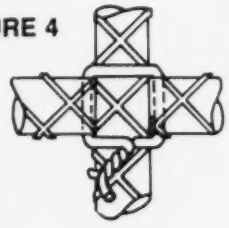
— Wall tie (wrap and snaptie)

**FIGURE 3**



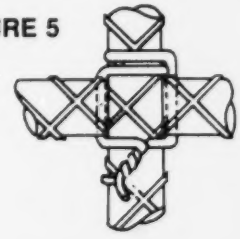
— Saddle tie

**FIGURE 4**



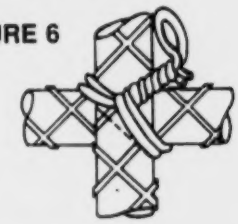
— Saddle tie with twist (wrap and saddle tie)

**FIGURE 5**



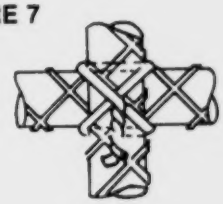
— Double strong single tie

**FIGURE 6**



— Cross tie (figure eight tie)

**FIGURE 7**

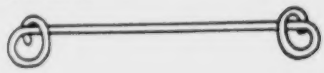


— Tie wire

**FIGURE 8**

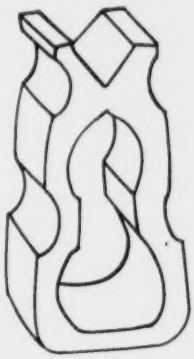
— Wire tie (pigtail)

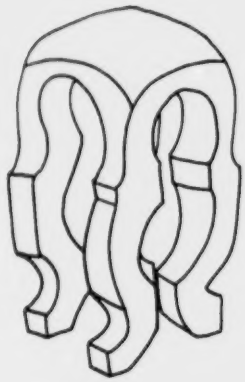
**FIGURE 9**



- Plastic rebar fasteners/clips

**FIGURE 10**





- Types of rebar splicing

— Wire tie lap splice

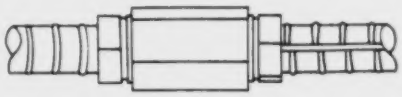
**FIGURE 11**

— G-loc butt splice

**FIGURE 12**

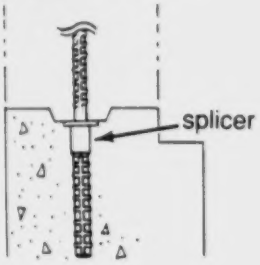
— Steel coupler type splice

**FIGURE 13**



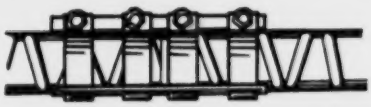
— Dowel bar splicer

**FIGURE 14**




— Speed sleeve butt splice

**FIGURE 15**



- Miscellaneous

  — Rebar caps

**FIGURE 16**

**NOTE:** Rebar caps must be placed over any protruding rebar ends to protect personnel (an OSHA requirement) from injuries.

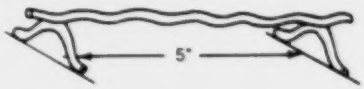
**OBJECTIVE 4**

**Given drawings, match reinforcing bar supports to their proper titles.** (Assignment Sheet 1)

- Types of rebar supports and their symbols

  — Slab bolster (SB) — used t support the top layer of rebar

**FIGURE 17**

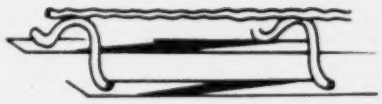



  — Slab bolster upper (SBU)

**FIGURE 18**

— Slab bolster with plates (SBP)

**FIGURE 19**

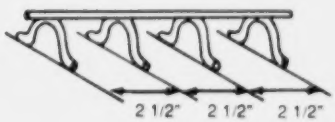


— Slab spacer (SS)

**FIGURE 20**

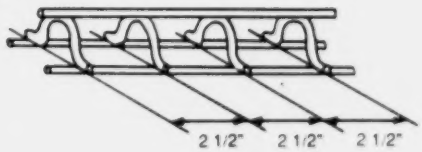
— Beam bolster (BB)

**FIGURE 21**




— Beam bolster upper (BBU)

**FIGURE 22**




— Individual bar chair (BC)

**FIGURE 23**

votech

— Joist chair (JC)

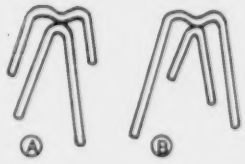
**FIGURE 24**

— Individual high chair (HC)

**FIGURE 25**

— High chairs for metal deck (HCM)

**FIGURE 26**

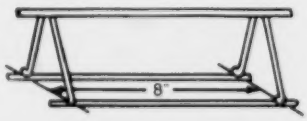



— Continuous high chair (CHC)

**FIGURE 27**

— Continuous high chair upper (CHCU)

**FIGURE 28**

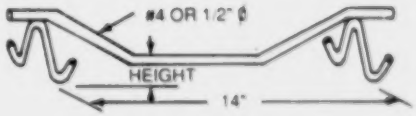


— Continuous high chair for metal deck (CHCM)

**FIGURE 29**

— Upper joist chair (UJC)

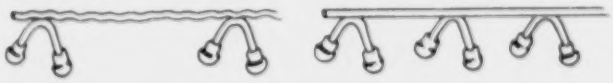
**FIGURE 30**




- Supports with plastic caps

**NOTE:** Many types and sizes of supports are equipped with plastic caps to prevent rusting when exposed to the elements.

**FIGURE 31**



- Special wire bar supports

**NOTE:** The special supports below are just a few of the methods used to support the upper mast of a thick concrete slab with two layers of rebars; in some cases such as the dowel block, the special support will support both mats.

— High chair with plates (HCP)

**FIGURE 32**

— Standee

**FIGURE 33**

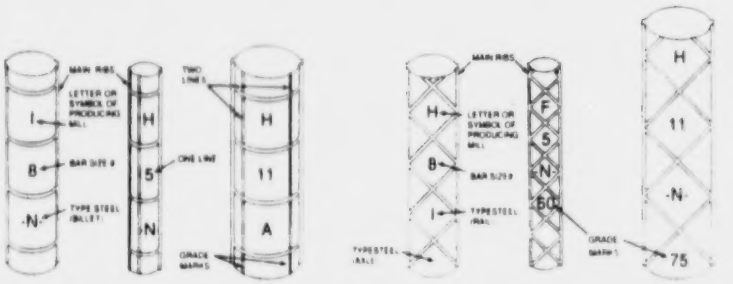
**OBJECTIVE 5** **Given drawings with identification markings, write in the specifications of standard reinforcing bars.** (Assignment Sheet 2)

- Rebar identification markings

  There are two methods used to mark the specifications of rebar; the line and number systems.

  — Line System — Number System

**FIGURE 34**




GRADE 40 GRADE 60 GRADE 75 GRADE 40 GRADE 60 GRADE 75
GRADE 50 GRADE 50

**NOTE:** There is also an S for billet steel meeting supplementary requirements, an R for rail meeting bend test requirements and a W for Low-Alloy steel.

1. First mark — Letter or symbol of the producing mill

2. Second mark — Bar size number (diameter)

3. Third mark — Letters designating type of steel; N - billet, A - axle, I - rail

4. Fourth mark - line system — lengthwise lines designate grades of steel; no line - Grade 40 & 50; one line - Grade 60; two lines - Grade 75. Number system — numbers show Grades 60 & 75; no numbers for 40 & 50.

   **NOTE:** Grades 60 & 75 bars must show grade marks, either by lines or by numbers; one line for 60,000 psi, two lines for 75,000 psi; the grade line marks are small and are between the two main ribs which are on opposite sides of all U.S. made bars.

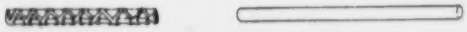
- Markings to identify rebar diameter or size

**NOTE:** Diameters are designated by numbers, each number denotes ⅛ inch. As an example, a #4 bar is 4× ⅛" or ⅘" in diameter. Smaller diameter bars are rolled into lengths up to 60 feet in length.

— #2 — ¼" rod diameter

**NOTE:** #2 bar may be ribbed or smooth.

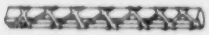
**FIGURE 35**



RIBBED SMOOTH

— #3 — 3/8" rod diameter

**FIGURE 36**



— #4 — 1/2" rod diameter

**FIGURE 37**

— #5 — 5/8" rod diameter

**FIGURE 38**

— #6 — 3/4" rod diameter

**FIGURE 39**

— #7 — 7/8" rod diameter

**FIGURE 40**

— #8 — 1" rod diameter

**FIGURE 41**

— #9 — 1⅛" rod diameter

**FIGURE 42**

— #10 — 1¼" rod diameter

**FIGURE 43**

— #11 — 1⅜" rod diameter

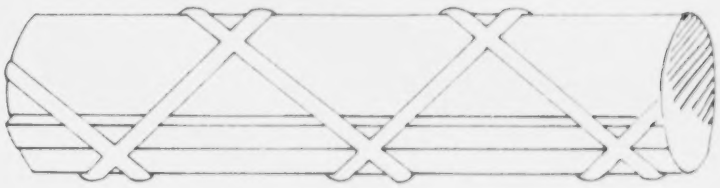
**FIGURE 44**

— #14 — 1¾" rod diameter

**FIGURE 45**

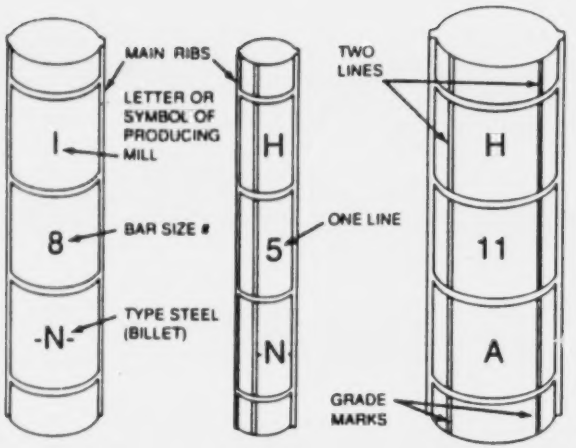
— #18 — 2¼ " rod diameter

FIGURE 46



# Rebar Identification

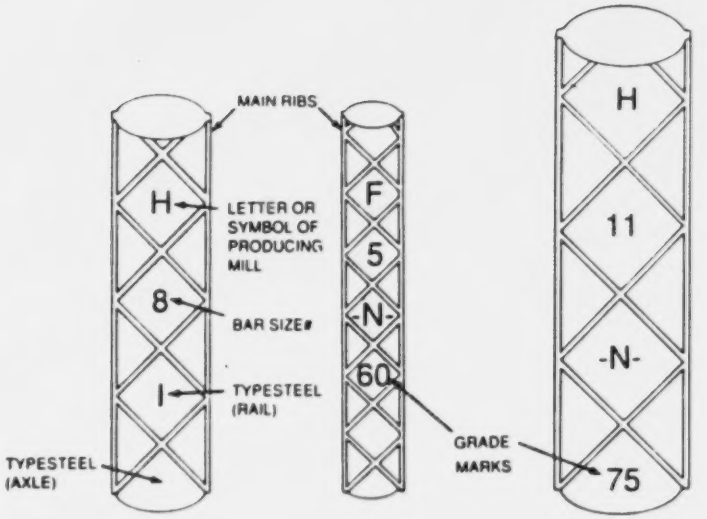
— Line System




GRADE 40 GRADE 60 GRADE 75

GRADE 50

— Number System




GRADE 40 GRADE 60 GRADE 75

GRADE 50

TRANSPARENCY MASTER 1 - Introduction to Concrete Reinforcing
CRSI - A 1 - 21

wtech

TM 1

| ASSIGNMENT SHEET 1 | CONCRETE REINFORCING MATERIALS | A I |
|---|---|---|

Name _____ Score _____

**OBJECTIVE 4**

**Given drawings, match reinforcing bar supports to their proper titles.**

**INTRODUCTION**

Rebar supports come in many sizes and types. Practice identifying common types by writing in the name of each below its drawing.

**INSTRUCTIONS**

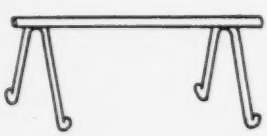
Identify the following types of rebar supports. Write the correct names in the blanks.

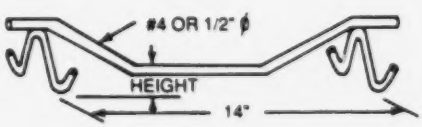
Functional Reading Skills
- Interpret graphics and symbols

Functional Writing
- Complete forms and records

**Special wire bar supports**
**Continuous high chair for upper deck**
**Slab bolster**
**Slab bolster upper**
**Slab bolster with plates**
**Beam bolster**
**Joist chair**
**Upper joist chair**
**Continuous high chair upper**
**Continuous high chair**
**High chair for metal deck**
**Individual high chair**
**Slab spacer**
**Beam bolster upper**
**Individual bar chair**

1. _____ 2. _____

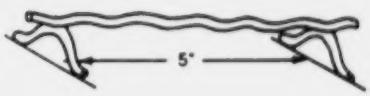




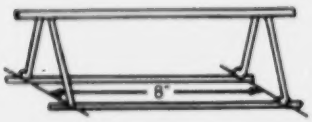

3. _____ 4 _____



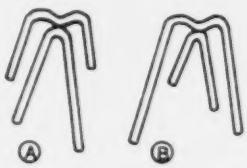
votech




5. _____




6. _____

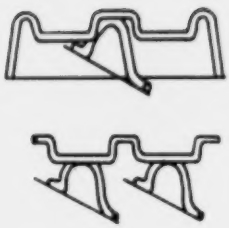


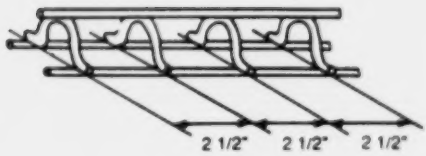

7. _____

8. _____

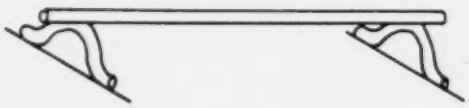
9. _____

10. _____

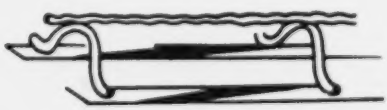





11. _____ 12. _____



13. _____ 14. _____



15. _____ 16. _____

| ASSIGNMENT SHEET 2 | CONCRETE REINFORCING MATERIALS | A I |
|---|---|---|

Name _____ Score _____

**OBJECTIVE 5**

**Given drawings with identification markings, write in the specifications of standard reinforcing bars.**

**INTRODUCTION**

The installer must be able to verify identification markings on rebars to be sure the correct grades and sizes are being placed in the locations where they are intended. There are some variations in bar identification marks: some markings may be read horizontally; grade mark numbers may be placed within separate consecutive deformation spaces and may read vertically or horizontally, and grade mark lines must be continued at least five deformation spaces. If the worker cannot read the markings for some reason he or she should check with the supervisor.

**INSTRUCTIONS**

Use the Information Sheet and the information above and below identify the markings on the rebars illustrated below and on the next page. Write the correct information in the blanks. Assume that the following names, initials, or symbols are different producing mills.

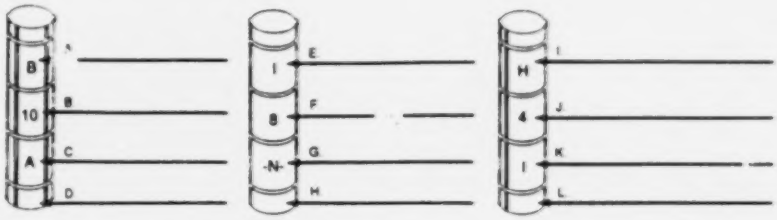
Functional Reading Skills
- Interpret graphics and symbols

C - Continental Steel Corporation
B - Bethlehem Steel
I - Inland Steel Company
P - Pittsburg Steel Corporation
F - Florida Steel Company
H - Holland Steel Company
◊ - Diamond Steel Mill
L - Lynchburg Mills

Operation and Calculation Skills
- Calculate with whole numbers
- Calculate with fractions
- Solve formulae and equations

Part A - Line system

1.



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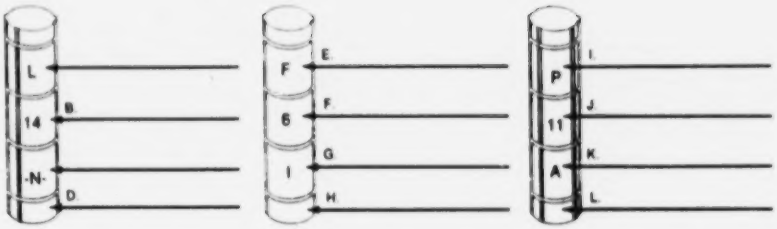
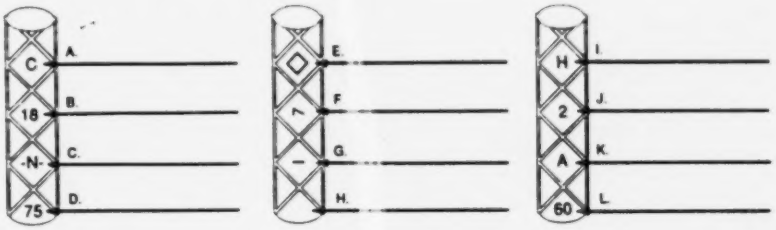
Math
Application Skills
- Use English and metric measures

2.

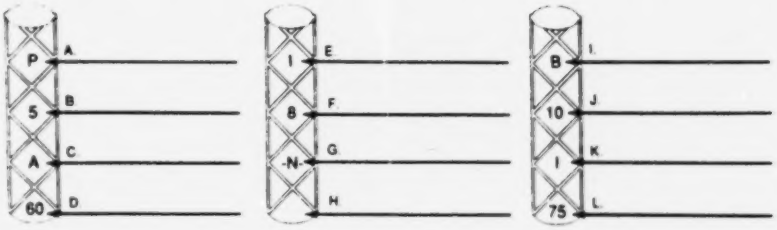



Part B - Number system

1.




2.



**ASSIGNMENT SHEET 1**

1. Individual high chair
2. Beam bolster
3. Continuous high chair
4. Upper joist chair
5. Slab bolster
6. Continuous high chair upper
7. High chairs for metal deck
8. Individual bar chair
9. Slab bolster upper
10. Continuous high chair for metal deck
11. Joist chair
12. Beam bolster upper
13. Special wire bar support
14. Slab spacer
15. Special wire bar support
16. Slab bolster with plates

**ASSIGNMENT SHEET 2**

Part A — Line system

| | | | | |
|---|---|---|---|---|
| 1. | a. | Bethlehem Steel | g. | Billet steel |
| | b. | 1¼ inch bar | h. | Grade 40-50 |
| | c. | Axle steel | i. | Holland Steel Co. |
| | d. | Grade 75 | j. | ½ inch bar |
| | e. | Inland Steel Company | k. | Rail steel |
| | f. | 1 inch bar | l. | Grade 60 |

| | | | | |
|---|---|---|---|---|
| 2. | a. | Lynchburg Mills | g. | Rail steel |
| | b. | 1¾ inch bar | h. | Grade 40-50 |
| | c. | Billet steel | i. | Pittsburg Steel Corp. |
| | d. | Grade 60 | j. | 1⅜ inch bar |
| | e. | Florida Steel Company | k. | Axle steel |
| | f. | ¾ inch bar | l. | Grade 75 |

Part B — Number system

| | | | | |
|---|---|---|---|---|
| 1. | a. | Continental Steel Corp. | g. | Rail steel |
| | b. | 2¼ inch bar | h. | Grade 40-50 |
| | c. | Billet steel | i. | Holland Steel Co. |
| | d. | Grade 75 | j. | ¼ inch bar |
| | e. | Diamond Steel Mill | k. | Axle steel |
| | f. | ⅞ inch bar | l. | Grade 60 |

2. a. Pittsburg Steel Corp.
   b. ⅝ inch bar
   c. Axle steel
   d. Grade 60
   e. Inland Steel Co.
   f. 1 inch bar
   g. Billet steel
   h. Grade 40-50
   i. Bethlehem Steel
   j. 1¼ inch bar
   k. Rail steel
   l. Grade 75

| WRITTEN TEST | CONCRETE REINFORCING MATERIALS | A I |
|---|---|---|

Name _____ Score _____

OBJECTIVE 1

**Given a list of terms associated with materials used in concrete reinforcing, match them to their correct definitions.** Write in the letter that corresponds to the most correct answer.

_____ 1. The nylon or plastic strands added to concrete to improve its tensile strength are called

a. wire fabric
b. steel formed concrete
c. mesh reinforcement
d. pigment admixture

_____ 2. The capacity of concrete to resist a bending, stretching, or twisting force is known as its

a. tensile strength
b. texture transfer
c. bonding capacity
d. hardness rating

_____ 3. The distance across a circular figure at the center point is known as its

a. circumference
b. radius
c. diameter
d. chord ring

_____ 4. Two thicknesses of tie wire is known as

a. double strong
b. dual loops
c. over-looped
d. thick-tie

*May be photocopied for student use.*

_____ 5. Semi-finished steel used to make rebar is called

a. axle steel
b. rail steel
c. fiber mesh
d. billet steel

_____ 6. Manufactured, precut lengths of wire ties that are formed with small loops at each end are

a. looping wires
b. pigtails
c. rebar loops
d. tensile ties

_____ 7. Deformed steel bars added to concrete to increase its tensile strength are

a. welded wire fabric
b. reinforcing fiber
c. deformed wire
d. rebar

_____ 8. Steel used to reinforce concrete by connecting the wires together in a grid pattern is called

a. formed fence steel
b. welded wire fabric
c. crossed fabric
d. rebar

_____ 9. Formed wire devices, used to support, hold, and space reinforcing bars are known as

a. wire fabric
b. jack support
c. pigtails
d. rebar supports

*May be photocopied for student use.*

_____10. Metal wire used to fasten reinforcing rods or wire fabric together is called

a. wire ties
b. rebar loops
c. cradles
d. clip rings

OBJECTIVE 2

**Interpret the numeric identity for common sizes of welded wire fabric rolls or sheets.**

_____ 1. A "6 × 6 - W 1.4 × W 1.4" welded wire fabric roll

a. has a six inch grid made of 14 gauge steel wire
b. has a six inch grid made of 10 gauge steel wire
c. has a four × six inch grid made of 40 gauge steel wire
d. has steel of 6 gauge wire with a grid width of 1.4 inches

_____ 2. A "4 × 4 - W 4.0 × W 4.0" welded wire fabric roll

a. has a four inch grid made of 10 gauge steel
b. is 4 feet wide, 4 feet long, and has a 4 inch grid
c. has a four inch grid made of 4 gauge steel wire
d. has a six inch grid made of 40 gauge wire

_____ 3. Which of the following sizes best represents a "6 × 6 - W 2.9 × W 2.9" sheet of welded wire?

a. A mat 8′ × 20′ made in a 6″ by 6″ grid of 6 gauge steel wire
b. A mat 6′ × 8′ long made of a 6″ by 6″ grid of 6 gauge wire
c. A mat 8′ × 20′ made in a 6″ by 6″ grid of 4 gauge wire
d. A roll of wire made in a 4″ by 4″ grid of 6 gauge wire

_____ 4. A sheet of welded fabric that is manufactured with a W 5.5 is made

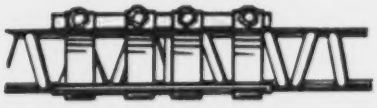
a. in a 5″ × 5″ grid
b. in a width of 5′5″
c. of 5.5 gauge steel wire
d. of 2 gauge steel wire

*May be photocopied for student use.*

**OBJECTIVE 3**

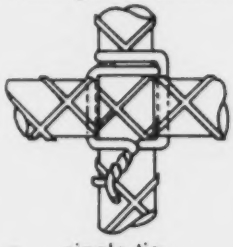
**Given illustrations, select the titles and use of hardware accessories used to install reinforcing bars.**

_____ 1. The figure shown below illustrates a/an



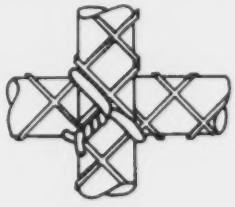
a. wire tie rebar splice
b. G-loc butt splice
c. dowel bar splicer
d. speed sleeve butt splice

_____ 2. This figure represents a



a. single tie
b. double loop tie
c. saddle tie
d. cross-hitch tie

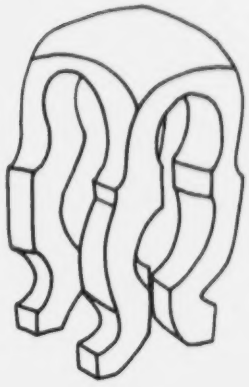
_____ 3. Connecting rebars as shown below uses a/an



a. loop tie
b. cross tie
c. single tie
d. over-hand tie

*May be photocopied for student use*

_____ 4. The figure below is called a plastic rebar



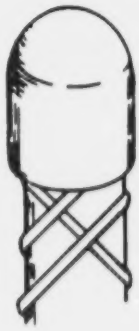
a. support bar
b. fastener or clip
c. extended tie
d. split support tie

_____ 5. The title of this hardware accessory is a

a. pigtail
b. wire loop
c. ring lock
d. simple splice wire

*May be photocopied for student use.*

_____ 6. This accessory is a



a. support cap
b. rebar cap
c. hub splice
d. rain cap

_____ 7. The figure below can be described as a

a. dowel bar splicer
b. G-loc splice
c. wireless coupler
d. steel coupler type splice

*May be photocopied for student use.*

_____ 8. The figure shown below is a

a. over-and-under tie
b. saddle tie
c. double saddle tie
d. double strong single tie

**OBJECTIVES 4 & 5**

Evaluated on assignment sheets in this unit. If you have not completed these components, see your instructor.

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| WRITTEN TEST ANSWERS | CONCRETE REINFORCING MATERIALS | A I |
|---|---|---|

**OBJECTIVE 1**

1. c
2. a
3. c
4. a
5. d
6. b
7. d
8. b
9. d
10. a

**OBJECTIVE 2**

1. b
2. c
3. a
4. d

**OBJECTIVE 3**

1. d
2. c
3. c
4. b
5. a
6. b
7. d
8. d

# CIMC
# TEST CODE SHEET

**VOCATIONAL PROGRAM (BOOK TITLE)** INTRODUCTION TO CONCRETE REINFORCING

**UNIT NUMBER AND TITLE** – A1 – CONCRETE REINFORCING MATERIALS

**TOTAL NUMBER OF TEST QUESTIONS** 22

**TOTAL NUMBER OF BASIC SKILL QUESTIONS** 4

| OBJECTIVE NUMBER | TEST QUESTION NUMBER(S) | BASIC SKILL CODE(S) |
|---|---|---|
| 1 | 1, 2, 7 | S |
| 1 | 3 | M |
| 1 | 4-6, 8-10 | X |
| 2 | 1-4 | X |
| 3 | 1-8 | X |
| 4 | Evaluated on Assignment Sheet 1 | |
| 5 | Evaluated on Assignment Sheet 2 | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
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| | | |
| | | |

| OBJECTIVE SHEET | CONCRETE REINFORCING TOOLS | A 2 |
|---|---|---|

**INTRODUCTION**

For concrete reinforcement, tools are used to cut, splice, bend, and install reinforcing steel. For smaller rebar sizes, hand cutting and bending tools can be used. To cut and bend larger sizes, the use of power tools is preferred.

**PREREQUISITE**

*Fundamentals of Construction*

**UNIT OBJECTIVE**

After completing this unit, the student will be able to identify the tools and equipment used in concrete reinforcing. The student will demonstrate these competencies by completing the assignment sheet and written test with a minimum of 85 percent accuracy.

**SPECIFIC OBJECTIVES**

After completing this unit, the student will be able to:

1. Given a list of terms associated with tools used in concrete reinforcing, match them to their correct definitions.
2. Choose the correct guidelines for the safe use and care of concrete reinforcing tools.
3. Given illustrations, select the correct titles of concrete reinforcing tools. (Assignment Sheet)

| SUGGESTED ACTIVITIES | CONCRETE REINFORCING TOOLS | A 2 |
|---|---|---|

**PREPARATION**

- Review unit and plan presentation.
- Order or obtain materials to supplement unit.
- Introduce unit.

**DELIVERY**

**Objective 1: Given a list of terms associated with tools used in concrete reinforcing, match them to their correct definitions.**

- Point out the importance of defining terms for common understanding.

**Objective 2: Choose the correct guidelines for the safe use and care of concrete reinforcing tools.**

- Explain the importance of buying quality tools.
- Discuss how good care will preserve the tools so that they will last many years.
- Outline your tool management system for shop and job site.
- Have students explain details of accidents they know of when someone used tools improperly.
- Discuss newspaper clippings or case studies that relate to improper use of tools.
- Demonstrate the proper use of the various tools, then have students repeat the demonstrations so they may get the feel of the various tools.
- Caution students to wear safety equipment especially eye protection and a hard hat when using tools.

**APPLICATION**

**Objective 3: Given illustrations, select the correct titles of concrete reinforcing tools.** (Assignment Sheet)

- Display a sample of each type of tool discussed in this section of the information sheet.
- Ask students to complete the Assignment Sheet.

**EVALUATION**

**Pretest**

- Give written test as pretest.
- Determine individual study requirements from pretest results.
- Counsel students individually on pretest results and study requirements.
- Modify materials in unit or create supplementary materials for individual students as required.

**Skill Test**

- Evaluate students on assignment sheet activities.
- Evaluate students on job sheet activities.
- Complete appropriate section of competency profiles.
- Reteach and reevaluate if necessary.
- Modify materials in unit or create supplementary materials for individual students as required.

**Written Test**

- Explain to students that they will be asked to demonstrate on the written test actions listed in the specific objectives.
- Give the written test.

  **NOTE:** The written test may be given in sections if desired.

- Complete appropriate sections of competency profiles.
- Reteach and retest if necessary.
- Review individual and group performance in order to evaluate teaching methods. Adjust scope, sequence, or instructional approaches for additional lessons as required.

**UNIT REFERENCES**


- Toenjes, Leonard P. *Building Trades Dictionary*. American Technical Publishers, Inc.: Homewood, IL, 1989.
- White, George. *Concrete Technology*. Delmar Publishers, Inc.: 2 Computer Drive West, Albany, NY.
- Willey, Al. *Residential Carpentry*. Oklahoma Department of Vocational and Technical Education/Curriculum and Instructional Materials Center, and The Associated General Contractors of America: Stillwater, OK, 1993.

| INFORMATION SHEET | CONCRETE REINFORCING TOOLS | A 2 |
|---|---|---|

**OBJECTIVE 1**

**Given a list of terms associated with tools used in concrete reinforcing, match them to their correct definition.**

- **ground fault circuit interruption (GFCI)** — special circuits used to protect workers from electrical shock when using AC powered tools and equipment
- **perpendicular** — exactly upright; at a right angle (90 degree angle) to another line or surface
- **plumb bob** — tool or device attached to a string; used to set and check for the vertical of a surface
- **soapstone** — soft stone used as a marker, sometimes called a lumber crayon
- **tying tool** — a tool used to install pigtails

**OBJECTIVE 2**

**Choose the correct guidelines for the safe use and care of concrete reinforcing tools.**

- Guidelines

  **NOTE:** These are the most common guidelines for all concrete reinforcing tools. Always follow tool manufacturer's instructions and OSHA regulations.

  — Use the correct tool for the job being performed.

  — Keep tools sharp.

  — Keep tools clean.

  — Inspect tools frequently to make sure they are in good condition.

  — Repair broken or damaged tools promptly.

— Dispose of broken or damaged tools that cannot be repaired.

— Keep tools within easy reach when working on a project .

— Oil tools that may not be used for some time.

— Never place tools on finished parts.

— Never place tools where they may fall.

— Stay alert when using tools.

— Wear eye protection and hard hat.

— Store tools properly when not in use.

— Use GFCI protected circuits when using electrical tools and equipment.

**OBJECTIVE 3** **Given illustrations, select the correct titles of concrete reinforcing tools.** (Assignment Sheet)

- Measuring devices

  — Folding rule

  — Steel tape

**FIGURE 1**

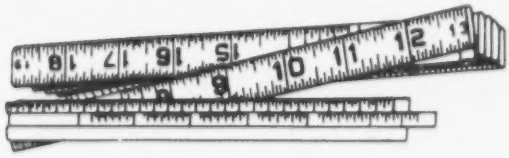
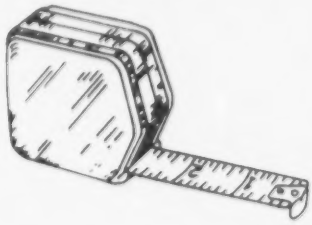
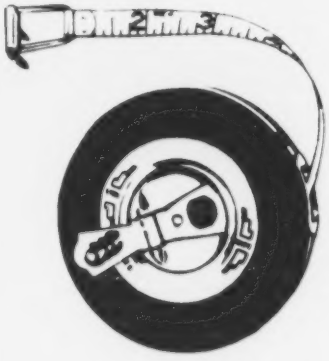


**FIGURE 2**



— 100 foot tape

**FIGURE 3**



- Marking devices

— Pencil — Keel (lumber crayon) — Soapstone

**FIGURE 4**

**FIGURE 5**

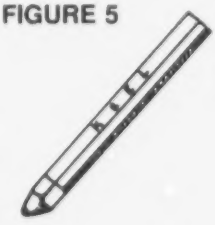


**FIGURE 6**

- Layout devices
  - — Framing square

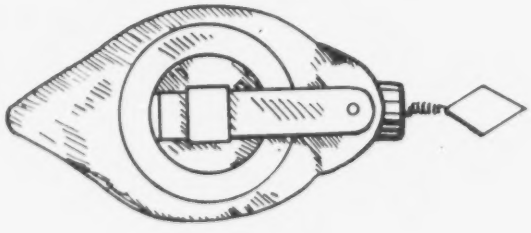
**FIGURE 7**

— Plumb bob

**FIGURE 8**

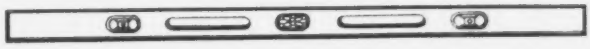
— Chalk box/line

**FIGURE 9**



- Hand levels
  - — 48-inch level

**FIGURE 10**



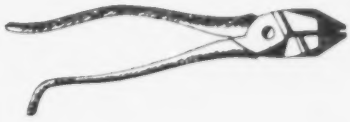
  - — Utility

**FIGURE 11**

- Pliers
  - — Side cutters
  - — High leverage side cutters

**FIGURE 12**

**FIGURE 13**



- Miscellaneous tools
  - — Tie wire reel
  - — Tying tool

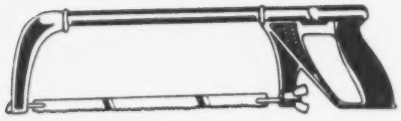
**FIGURE 14**

**FIGURE 15**

- Cutting tools

— Hacksaw

**FIGURE 16**

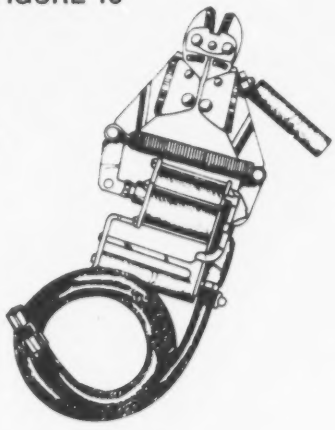


— Bolt cutters

**FIGURE 17**

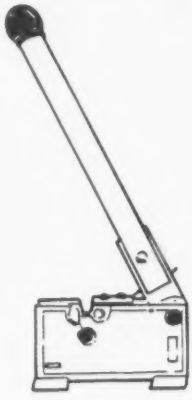
— Portable air powered cutter

**FIGURE 18**



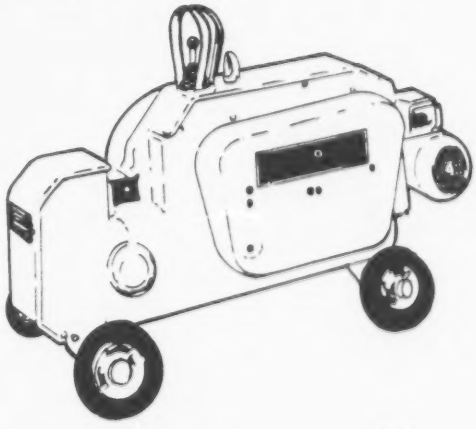
— Hand rebar cutter

**FIGURE 19**



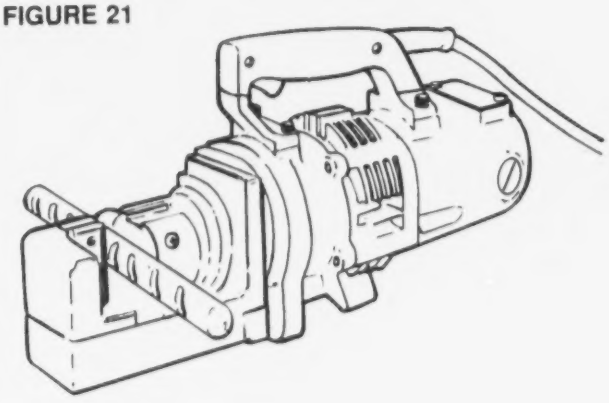
— Power bar shears

**FIGURE 20**



— Power rebar cutters

**FIGURE 21**



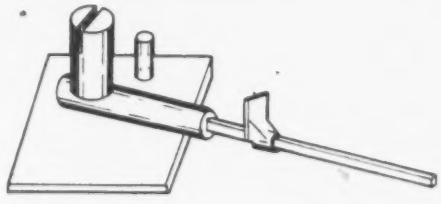
- Bar benders

— Rod bender (Hickey)

**FIGURE 22**

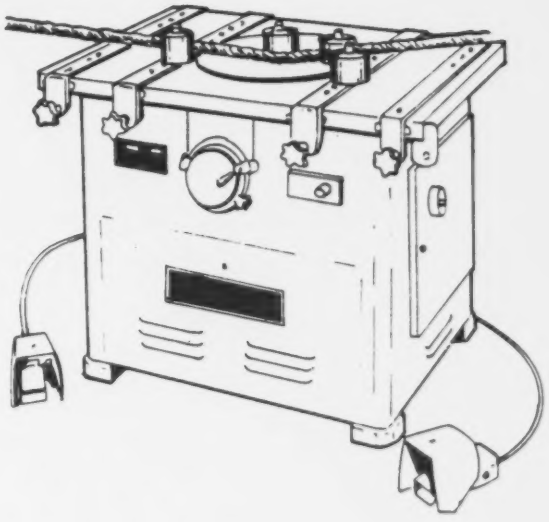
— Rebar bender

**FIGURE 23**



— Power bar bender

**FIGURE 24**



**ASSIGNMENT SHEET**

# CONCRETE REINFORCING TOOLS — A 2

Name _____ Score _____

**OBJECTIVE 3**

**Given illustrations, select the correct titles of concrete reinforcing tools.**

**INTRODUCTION**

This exercise will give you practice identifying common tools used to cut, splice, bend, and install concrete reinforcing steel.

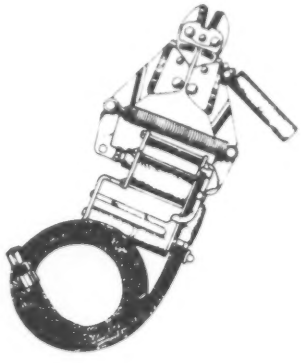
**INSTRUCTIONS**

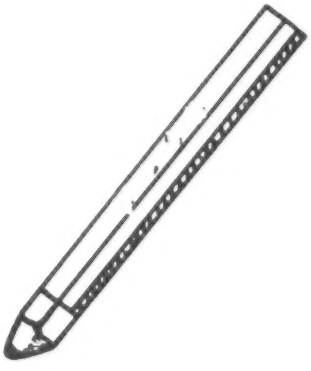
Identify tools used to install concrete reinforcing steel. Write the correct names in the blanks.

Functional Reading Skills
- Interpret graphics and symbols

Functional Writing
- Complete forms and records

| | | |
|---|---|---|
| Hand rebar cutter | Folding rule | High leverage side cutters |
| Utility level | Rebar bender for stirrups | Power bar shears |
| Soapstone | Chalk box/line | Plumb bob |
| Pencil | Framing square | 48 inch mason's level |
| Power rebar cutters | Keel | Bolt cutters |
| Rod bender | Side cutters | Tying tool |
| Tie wire reel | Power bar bender | Portable air-powered cutter |
| Hacksaw | Steel tape | |

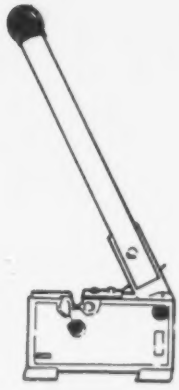




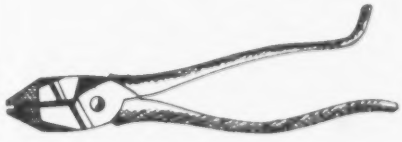
1. _____ 2. _____



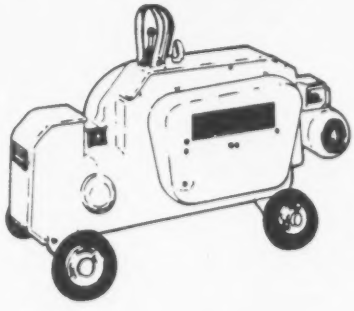
votech



3. _____ 4. _____

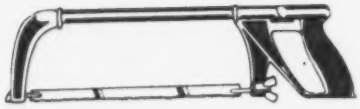


5. _____ 6. _____



7. _____ 8. _____

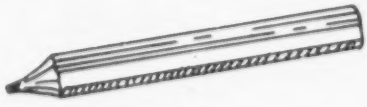
9. _____



10. _____

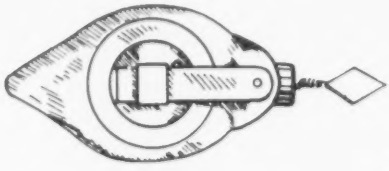
11. _____

12. _____



13. _____

14. _____

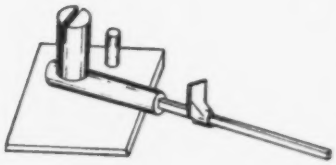


15. _____



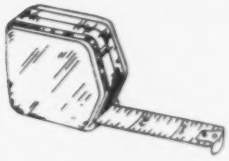
votech

16. _____

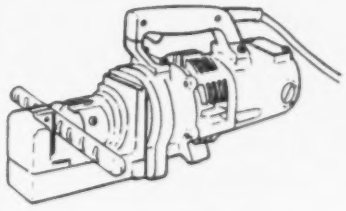


17. _____

18. _____



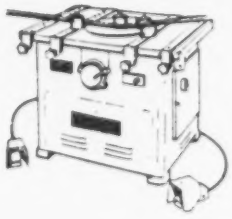
19. _____



20. _____

21. _____

22. _____



23. _____

| ASSIGNMENT ANSWERS | CONCRETE REINFORCING TOOLS | A 2 |
|---|---|---|

**ASSIGNMENT SHEET**

1. Portable air-powered cutter
2. Keel or lumber crayon
3. Framing square
4. Hand rebar cutter
5. High leverage side cutters
6. Utility level
7. Plumb bob
8. Power bar shears
9. Soapstone
10. Hacksaw
11. 48-inch mason's level
12. Folding rule
13. Pencil
14. Side cutters
15. Chalk box/line
16. Tying tool
17. Rebar bender
18. Rod bender or hickey
19. Steel tape
20. Power rebar cutters
21. Tie wire reel
22. Bolt cutters
23. Power bar bender

| WRITTEN TEST | CONCRETE REINFORCING TOOLS | A 2 |
|---|---|---|

Name _____ Score _____

OBJECTIVE 1

**Given a list of terms associated with tools used in concrete reinforcing, match them to their correct definitions.** Write the letter that corresponds to the correct definition.

_____ 1. The supporting straps that hold rebar in place are

a. stirrups
b. keels
c. rebar saddles
d. support reels

_____ 2. A tool used to install pigtails is a

a. pigtail wrench
b. keels
c. stirrups
d. tying tool

_____ 3. Soft stone used as a marker is known as a

a. pencil
b. scribe
c. soapstone
d. stone pen

_____ 4. Exactly upright, at a right angle to another line or surface is known as being

a. level
b. straight
c. parallel
d. perpendicular

*May be photocopied for student use.*

_____ 5. A marking tool that is sometimes called a lumber crayon is also known as a

a. soapstone
b. keel
c. pencil
d. stirrup marker

_____ 6. A tool used to set and check for the vertical of a surface is a

a. plumb bob
b. framing square
c. keel
d. chalk box line

OBJECTIVE 2

**Choose the correct guidelines for the safe use and care of concrete reinforcing tools.**

_____ 1. Use the _____ tool for the job being performed

a. nearest
b. correct
c. damaged
d. all the above

_____ 2. To make sure tools are in good condition

a. place them on finished parts
b. dispose of them quickly
c. use them for any purpose
d. inspect them frequently

_____ 3. Tools should be

a. stored properly when not used
b. kept clean
c. repaired when broken
d. all the above

*May be photocopied for student use*

_____ 4. When tools are to be stored for some time, they should be

a. oiled
b. replaced
c. wrapped in plastic
d. painted

_____ 5. When using concrete reinforcing tools, what safety equipment must be worn by the worker?

a. Respirator
b. Eye protection and a hard hat
c. Safety glasses and respirator
d. Face shield and knee pads

_____ 6. When working on a project, where should tools be kept?

a. Stored in pockets
b. In the tool storeroom
c. Within easy reach
d. Where they may fall

_____ 7. When using electrical tools and equipment, you must use

a. a support reel
b. GFCI protected circuits
c. ungrounded extension cords
d. ROI grounded tools

_____ 8. When using tools

a. stay alert
b. place them on finished parts
c. return defective tools to your tool box
d. use ROI grounded circuits

**OBJECTIVE 3**

This objective is evaluated through the completion of an Assignment Sheet.

*May be photocopied for student use*



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| WRITTEN TEST ANSWERS | CONCRETE REINFORCING TOOLS | A 2 |
|---|---|---|

**OBJECTIVE 1**

1. a
2. d
3. c
4. d
5. b
6. a

**OBJECTIVE 2**

1. b
2. d
3. d
4. a
5. b
6. c
7. b
8. a



wotech

# CIMC
# TEST CODE SHEET

**VOCATIONAL PROGRAM (BOOK TITLE)** INTRODUCTION TO CONCRETE REINFORCING

**UNIT NUMBER AND TITLE** – A2 – CONCRETE REINFORCING TOOLS

**TOTAL NUMBER OF TEST QUESTIONS** 14

**TOTAL NUMBER OF BASIC SKILL QUESTIONS** 1

| OBJECTIVE NUMBER | TEST QUESTION NUMBER(S) | BASIC SKILL CODE(S) |
|---|---|---|
| 1 | 1-3, 5, 6 | X |
| 1 | 4 | M |
| 2 | 1-8 | X |
| 3 | Evaluated on the Assignment Sheet | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

| OBJECTIVE SHEET | APPLIED SKILLS | A 3 |
|---|---|---|

**INTRODUCTION**

Concrete strength can be greatly increased by the proper use of concrete reinforcing. Reinforcing expands the uses of concrete to structures such as bridges, roadways, and multi-storied buildings.

Closely following building plans and the techniques outlined in this unit, you can construct safe and durable structures.

**PREREQUISITE**

*Fundamentals of Construction*

**UNIT OBJECTIVE**

After completing this unit, the student will be able to demonstrate these competencies by completing the assignment sheet, job sheets, and written test with a minimum of 85 percent accuracy.

**SPECIFIC OBJECTIVES**

After completing this unit, the student will be able to show the ability to:

1. Given a list of terms associated with the skills needed to install concrete reinforcing, match them to their correct definitions.
2. Choose the basic skills required to install concrete reinforcing.
3. Given drawings, match reinforcing bar shapes to their purposes.
4. Given choices, select the correct rules to install concrete reinforcing.
5. Install reinforcing bars for a footing. (Job Sheet 1)
6. Install reinforcing bars in a wall. (Job Sheet 2)
7. Lay and tie welded wire fabric. (Job Sheet 3)

| SUGGESTED ACTIVITIES | APPLIED SKILLS | A 3 |
|---|---|---|

**PREPARATION**

- Review unit and plan presentation.
- Order or obtain materials to supplement unit.
- Introduce unit.

**DELIVERY**

**Objective 1: Given a list of terms associated with the skills needed to install concrete reinforcing, match them to their correct definitions.**

- Use Information Sheet to discuss terms and definitions associated with concrete reinforcing basic skills.
- Show samples or examples of terms if appropriate.
- Point out the importance of understanding the terms and definitions and how knowing them will help students to better understand this unit.
- Use the transparency to discuss dowel rods.

**Objective 2: Choose the basic skills required to install concrete reinforcing.**

- Use Information Sheet to discuss basic skills used in reinforcing operations.
- Discuss in detail each of the specific jobs and skills done by reinforcing installers.
- Invite a reinforcing installer to the class to discuss basic skills and jobs with the students.

**Objective 3: Given drawings, match reinforcing bar shapes to their purposes.**

- Use the Information Sheets to describe the shapes and purposes of bends in rebar.

**Objective 4: Given choices, select the correct rules to install concrete reinforcing.**

- Use the Information Sheets to describe the rules to install concrete reinforcing.
- Emphasize the OSHA requirement to place caps over protruding rebar ends to protect personnel.

APPLICATION

**Objective 5: Install reinforcing bars for a footing.** (Job Sheet 1)

**Objective 6: Install reinforcing bars in a wall.** (Job Sheet 2)

**Objective 7: Lay and tie welded wire fabric.** (Job Sheet 3)

- Allow students to practice the procedures in the job sheets.
- Have students complete Job Sheets 1, 2, and 3.

EVALUATION

**Pretest**

- Give written test as pretest.
- Determine individual study requirements from pretest results.
- Counsel students individually on pretest results and study requirements.
- Modify materials in unit or create supplementary materials for individual students as required.

**Skill Test**

- Evaluate students on assignment sheet activities.

- Evaluate students on job sheet activities.
- Complete appropriate section of competency profiles.
- Reteach and reevaluate if necessary.
- Modify materials in unit or create supplementary materials for individual students as required.

**Written Test**

- Explain to students that they will be asked to demonstrate on the written test actions listed in the specific objectives.
- Give the written test.

  **NOTE:** The written test may be given in sections if desired.
- Complete appropriate sections of competency profiles.
- Reteach and retest if necessary.
- Review individual and group performance in order to evaluate teaching methods. Adjust scope, sequence, or instructional approaches for additional lessons as required.

SUGGESTED RESOURCES

**Print Media**

- *Manual of Standard Practice*. Concrete Reinforcing Steel Institute, 933 N. Plum Grove Road, Schaumburg, IL 60195.

UNIT REFERENCES


- Hendrix, Laborn J. "Bud." *Construction Craftsman's Curriculum Instructional Materials I.* Stillwater, Oklahoma: Department of Vocational and Technical Education/Curriculum and Instructional Materials Center and The Associated General Contractors of America.
- Hendrix, Laborn J. "Bud." *Millwright Instructional Materials.* Stillwater, Oklahoma: Department of Vocational and Technical Education/Curriculum and Instructional Materials Center and The Associated General Contractors of America..

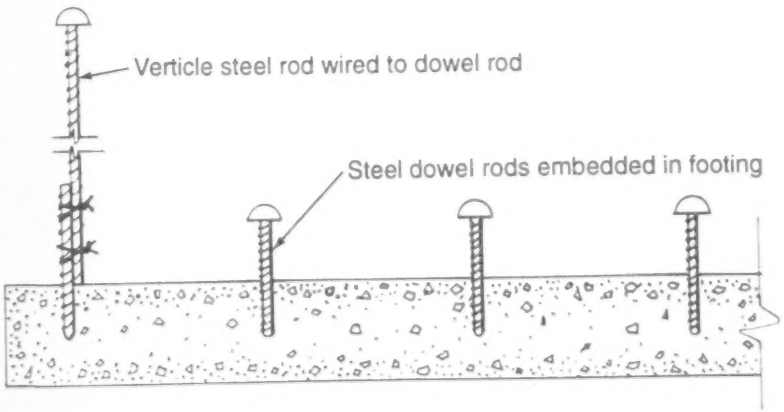
OBJECTIVE 1

**Given a list of terms associated with the skills needed to install concrete reinforcing, match them to their correct definitions.**

- **concrete coverage** — the distance at which reinforcing steel is embedded into the concrete. A minimum coverage is specified on the building plans

- **dowels** — reinforcing bars connecting two separately cast sections of concrete. These are also known as *stub rods*.

FIGURE 1




- **mat** — grid of preassembled reinforcing bars

- **reinforcing steel** — steel bars or wires embedded in concrete and located in such a manner that the metal and the concrete act together in resisting loads

OBJECTIVE 2

**Choose the basic skills required to install concrete reinforcing.**

- Basic skills
  - — Identify hand tools used in reinforcing work.
  - — Use and care for tools properly.
  - — Identify equipment related to reinforcing.
  - — Identify materials used in concrete reinforcing.
  - — Use measuring, leveling, and plumbing devices accurately.
  - — Set up ladders and scaffolds properly.
  - — Identify hitches, knots, and accessories used in rigging.
  - — Rig and handle different types of loads.
  - — Distinguish and give hand signals used in rigging operations.
  - — Set up and use a cutting torch.
  - — Set up and use a welder.
  - — Identify concrete reinforcing symbols and abbreviations found on plans.
  - — Make the various types of ties used to secure reinforcing.
  - — Install reinforcing bars for footings.
  - — Install reinforcing bars in walls, columns, and slabs.
  - — Lay and tie welded wire fabric.
  - — Know and follow safety rules and regulations.

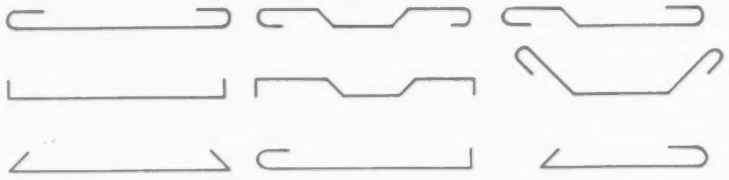
OBJECTIVE 3

**Given drawings, match reinforcing bar shapes to their purposes.**

- Shapes of reinforcing bars.

  — Shear or truss bars

**FIGURE 2**



Shear and truss bars are shaped to be used primarily in rebar mats to reinforce concrete.

— Stirrups

**FIGURE 3**

Stirrups are steel rebar shaped to support other reinforcement such as rebar, beams, plates, or welded fabric.

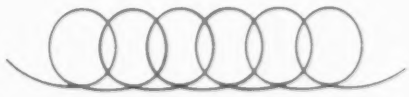
— Column reinforcement

**FIGURE 4**

a. Square

b. Round

c. Spiral



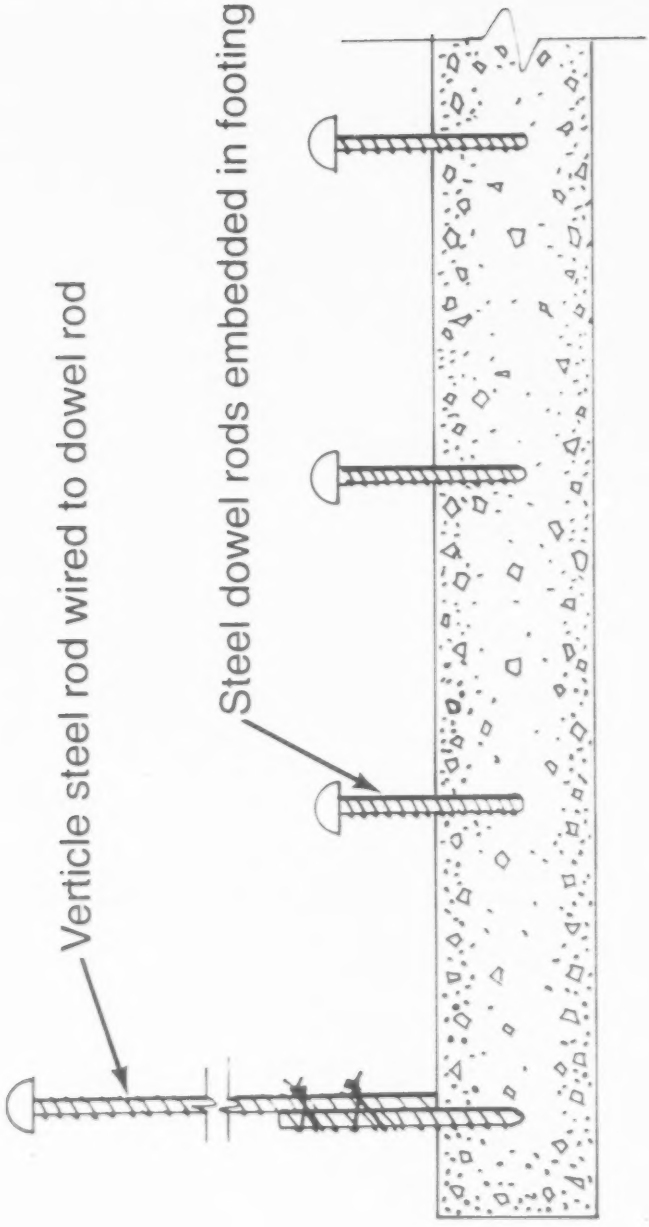
**NOTE:** These reinforcing bar shapes can be bent/shaped at the job site or preshaped/assembled and transported to the job site.

OBJECTIVE 4

**Given choices, select the correct rules to install concrete reinforcing.**

- General rules to follow when using steel reinforcing
  - — Use clean steel free from oil, dust, paint, and scale.
  - — Place steel as determined by building code, plans, or specifications.

- Lap bars a minimum of 30 times their diameter and never less than 15 inches or according to specifications.
- Butt weld bars according to specifications.
- Place reinforcing primarily where the concrete will be in tension and shear forces exist.
- Tie reinforcing solidly so that it cannot shift when concrete is placed.
- Never use incorrectly marked rebar.
- Place rebar caps over any protruding rebar ends as a safety precaution.
- Steel reinforcement must be placed with a specified concrete coverage. Carefully review plans to ensure reinforcement is not placed too near concrete edges or surfaces.
- Always apply form oil before installing reinforcing.


Steel dowel rods embedded in footing
Verticle steel rod wired to dowel rod

| JOB SHEET 1 | APPLIED SKILLS | A 3 |
|---|---|---|

Name _____ Score _____

**OBJECTIVE 5**

**Install reinforcing bars for a footing.**

**INTRODUCTION**

This exercise will give you practice in the layout and installation of rebar for a 6′ 9″ footing. The footing will require #4 rebar placed at 12 O.C.

**TOOLS AND EQUIPMENT**

- Eye protection and hard hat
- Side cutters, one pair
- Folding rule or tape
- Soapstone
- Wire reel and tie wire
- Twelve #4 rebars 5′-6″ long
- Twelve bricks or pieces of concrete bricks, chairs, or bolsters as per specifications

**PROCEDURE**

Functional Reading Skills
- Follow written instructions
- Interpret graphics and symbols

General Science
- Use scientific instruments

| | | Yes | No |
|---|---|---|---|
| 1. | Put on eye protection, gloves, and hard hat. | ___ | ___ |



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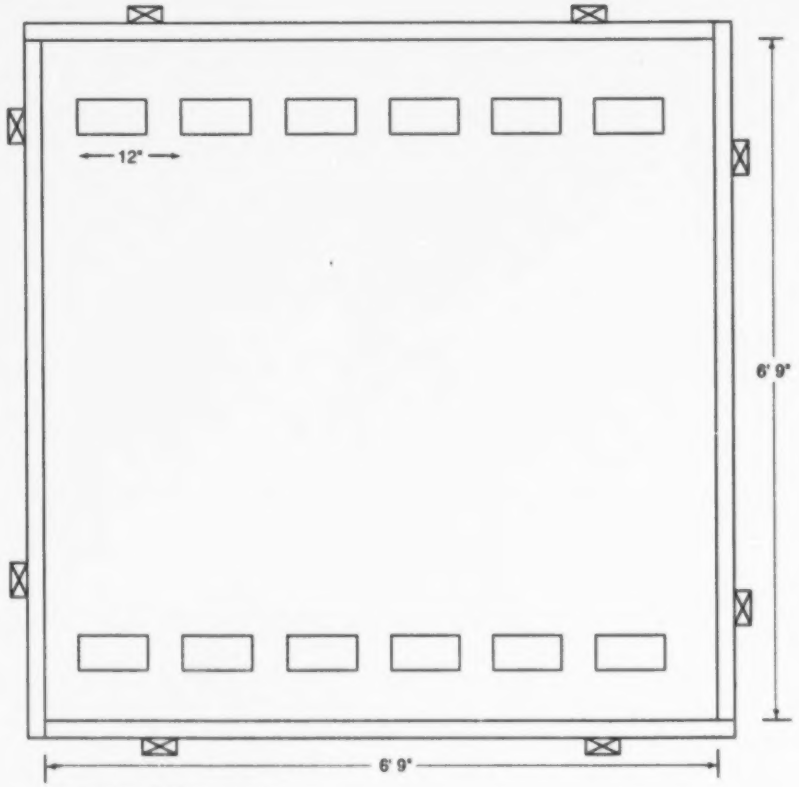
Yes No

2. Place six bricks, chairs, or bolsters flat on bottom of footing as shown below approximately twelve inches apart to support the rebar. (Figure 5) ___ ___

**FIGURE 5**




Scale: 5/8" = 12"

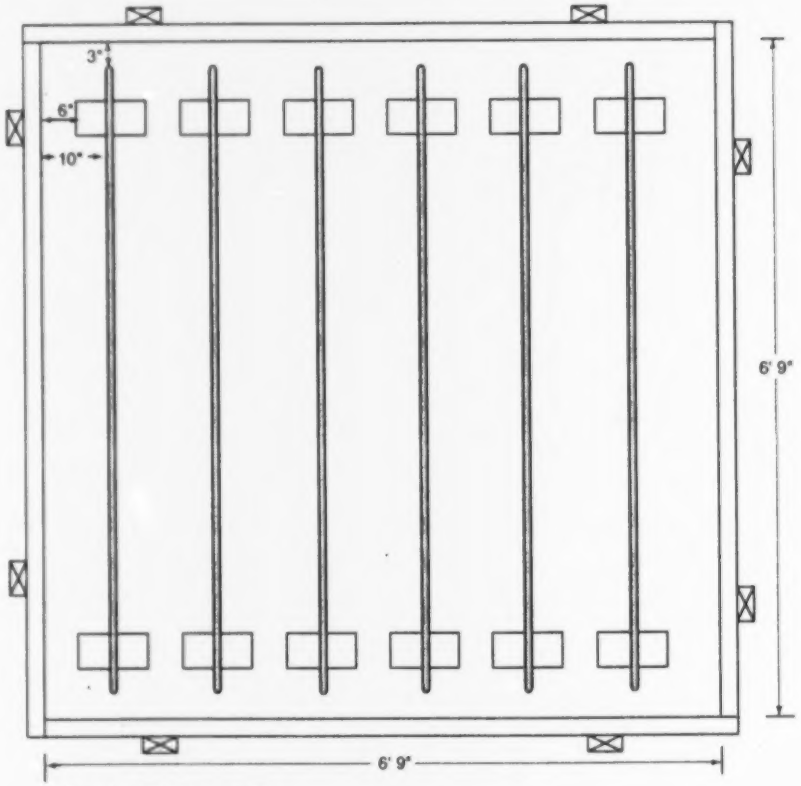
3. The first bricks should be positioned 6" from the form sides. (Figure 6) ___ ___

Yes No

4. Place six rods across the bricks, laying rods as shown below, with the two outside rods ten inches in from the edge of the footing; using keel and rule, place marks on two outside rods twelve inches apart, starting three inches from end. — —

**NOTE:** When installing rods against earth a three inch clearance between end of rod and earth is required.

**FIGURE 6**

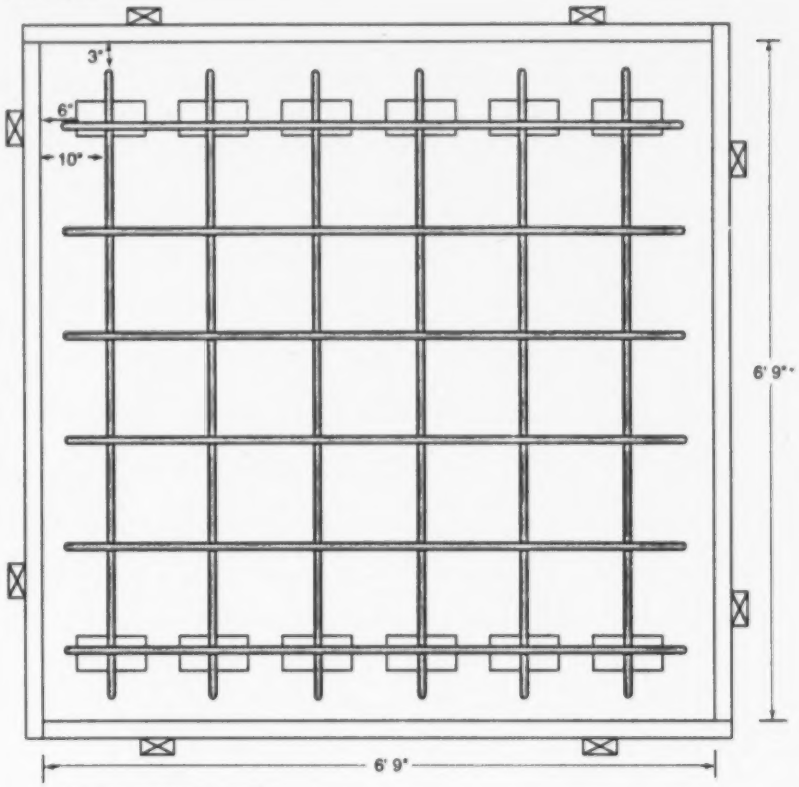



Scale: 5/8" = 12"

Yes No

5. Place remaining six rods across other six rods aligning them with the twelve-inch marks. ___ ___

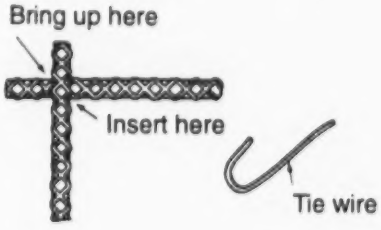
**FIGURE 7**




Scale: 5/8" = 12"

6. Pull a small amount of wire from reel and put small hook in the end of tie wire; insert wire down and under the two rods so that end will come up on opposite side. ___ ___

**FIGURE 8**



Yes No

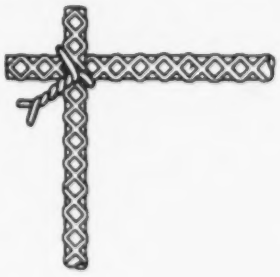
7. Hold wire; grasp both sections with side cutters and twist. ___ ___

**FIGURE 9**

**FIGURE 10**

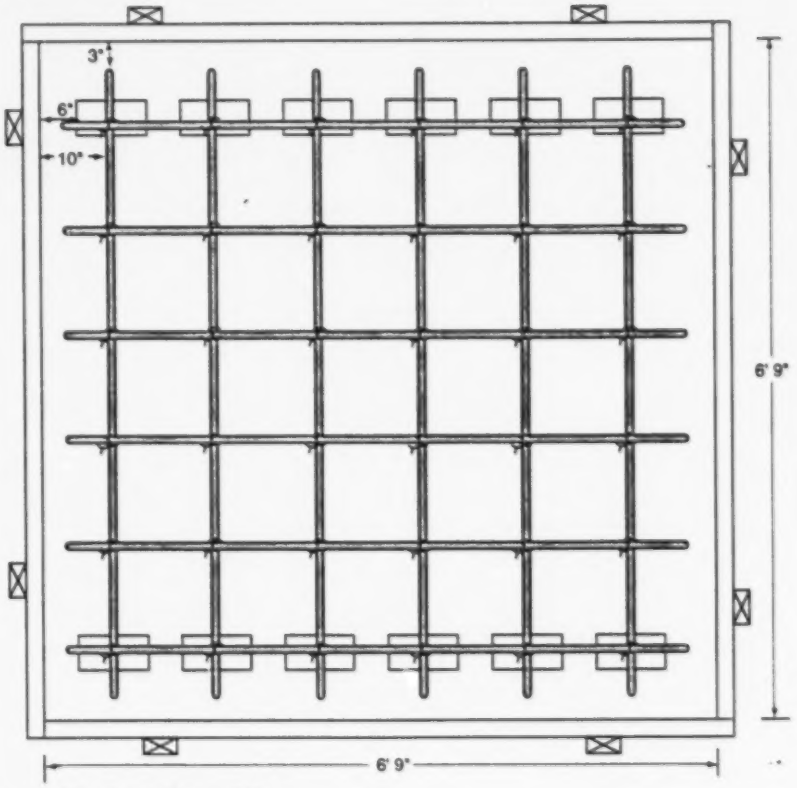
8. Make about three or four twists; cut both wires so there will be approximately three-quarters of an inch left; then tap these ends down with side cutters. ___ ___

**FIGURE 11**



| | Yes | No |
|---|---|---|
| 9. Continue this operation until entire reinforcing mat has been tied together. | ___ | ___ |

**FIGURE 12**




Scale: 5/8" = 12"

**NOTE:** Steel mats in small footings are usually preassembled and then placed after forms are set.

| | | |
|---|---|---|
| 10. This concludes this Job Sheet. Ask your instructor to evaluate your work. | ___ | ___ |
| 11. Clean up the area and put away all tools and materials. | ___ | ___ |

(End of Job Sheet)

## SKILL TEST RECORD

**EVALUATOR'S COMMENTS**

_____

_____

_____

**PRODUCT EVALUATION**

**Evaluator note:** Rate the student on the following criteria by circling the appropriate numbers. Each criterion must receive a rating of "3" or higher to demonstrate student mastery. (See Performance Evaluation Key.) A student who is unable to demonstrate mastery should review the material and submit another product for evaluation.

| Criteria: | | | | |
|---|---|---|---|---|
| Rebar supports set properly (+/- ½") | 4 | 3 | 2 | 1 |
| Rebar set from edges and ends (+/- ¼") | 4 | 3 | 2 | 1 |
| Bars aligned at 12" mark (+/-¼") | 4 | 3 | 2 | 1 |
| Wire ties secured (¼") | 4 | 3 | 2 | 1 |

**EVALUATOR'S COMMENTS**

_____

_____

_____

**AVERAGE RATING**

**Evaluator note:** To obtain an average rating for the Competency Profile, total the designated points in "Product Evaluation" and divide by the total number of criteria. Circle the rating on the "Performance Evaluation Key" below.

**PERFORMANCE EVALUATION KEY**

4 **Skilled** — Can perform job with no additional training
3 **Moderately Skilled** — Has performed job during training program; limited additional training may be required
2 **Limited Skill** — Has performed job during training program; additional training is required to develop skill
1 **Unskilled** — Is familiar with process, but is unable to perform job

| JOB SHEET 2 | APPLIED SKILLS | A 3 |
|---|---|---|

Name _____ Score _____

**OBJECTIVE 6**

**Install reinforcing bars in a wall.**

**INTRODUCTION**

Preparing reinforcing bars in a wall requires you to attach rebar to dowels with wire ties and install rods to form a grid pattern across the wall form. The rebar in this exercise are to be assembled into a grid pattern primarily of 12″ × 12″ squares.

**TOOLS AND EQUIPMENT**

- Eye protection, gloves, and hard hat
- Side cutters, one pair
- Folding rule or tape
- Yellow keel, one piece
- Wire reel and wire
- Eight #4 rebar 3′-10½″ long
- Four #4 rebar 7′-9″ long

**PROCEDURE**

Functional Reading Skills
- Follow written instructions
- Interpret graphics and symbols

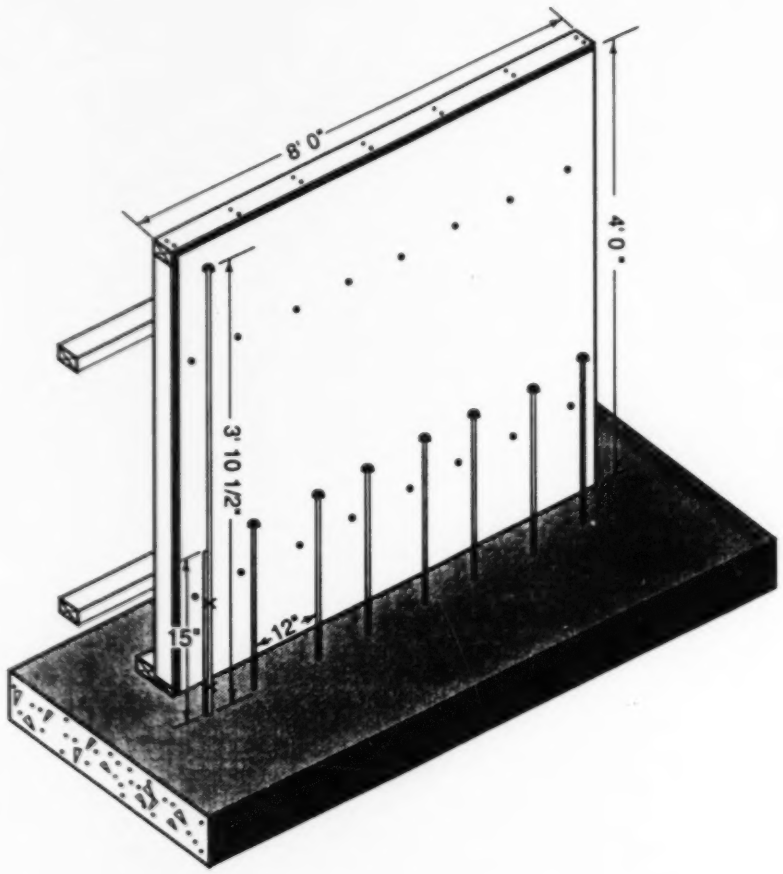
General Science
- Use scientific instruments

| | | Yes | No |
|---|---|---|---|
| 1. | Put on eye protection, gloves, and hard hat. | ___ | ___ |
| 2. | Remove the rebar caps. | ___ | ___ |

Yes No

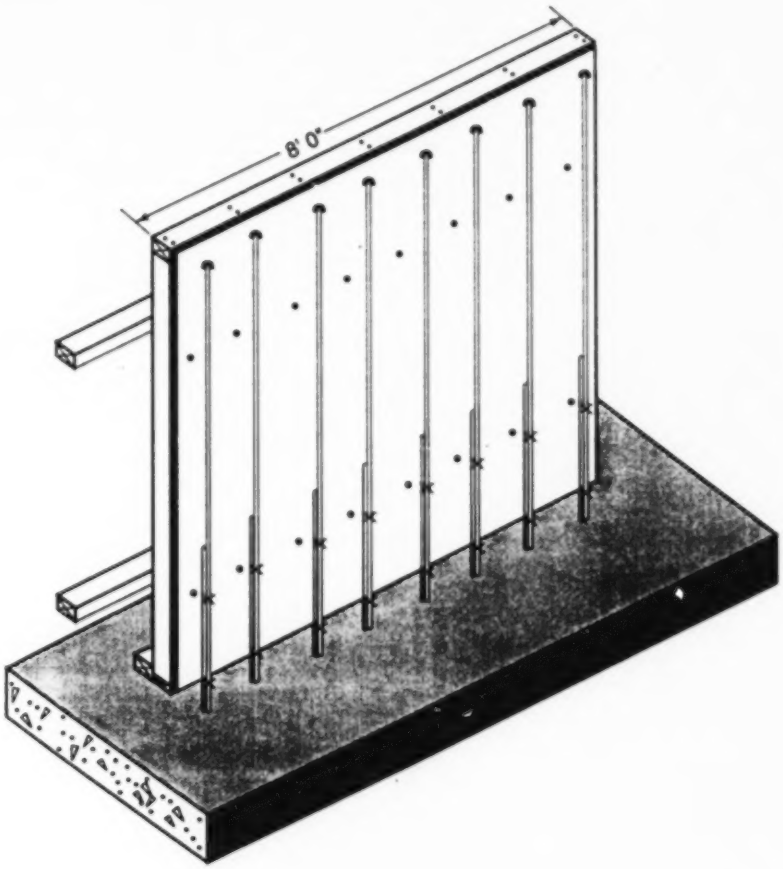
3. Stand one short rod against first dowel and tie together. (Figure 13) ___ ___

**FIGURE 13**



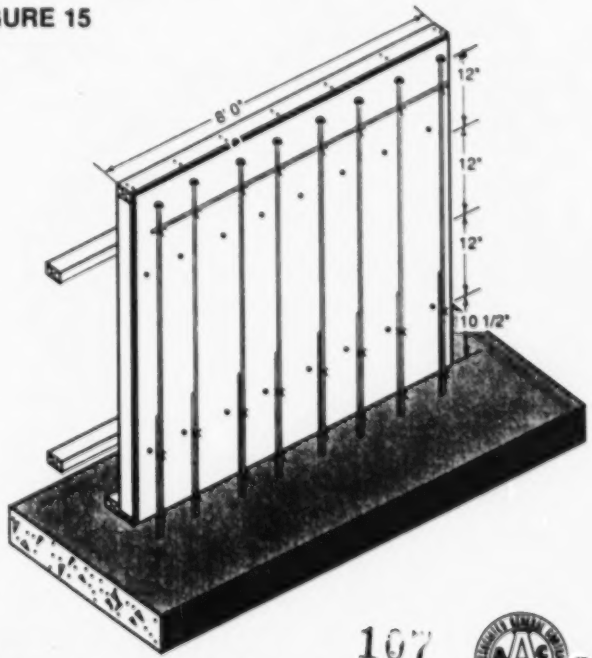
| | Yes | No |
|---|---|---|
| 4. Continue this procedure until all of the short rods have been tied and are standing. (Figure 14) | ___ | ___ |

**FIGURE 14**



| | Yes | No |
|---|---|---|
| 5. Lay out vertical rods | | |
| a. Mark both end rods at twelve inches starting from slab; this will leave only ten and one half inches on the top section. (Figure 14). | ___ | ___ |
| **NOTE:** One and one half inches is standard clearance from edge of forms or face of concrete. | | |
| 6. Lay out horizontal rods | | |
| a. Use rule and keel to measure and mark on first rod starting at four and one half inches from end of rod, make a mark every twelve inches. | ___ | ___ |
| 7. Take first rod and temporarily fasten it at top mark on rod at right end, allowing for one and one half inch clearance; then, using tie, fasten rod to top mark on rod at left end. (Figure 15) | ___ | ___ |

**FIGURE 15**



Yes No

8. Remove temporary tie from right end and, using wire tie, tie two rods together. ___ ___

   **NOTE:** Wire tie is made by pulling small amount of wire from reel. Start wire from lower right hand junction of two rods. Push wire through, then out and around top part of short rod, and then back through upper left-half junction. (See Figures 16, 17, and 18.)

**FIGURE 16**

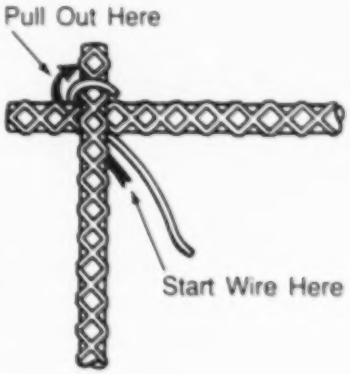



**FIGURE 17**

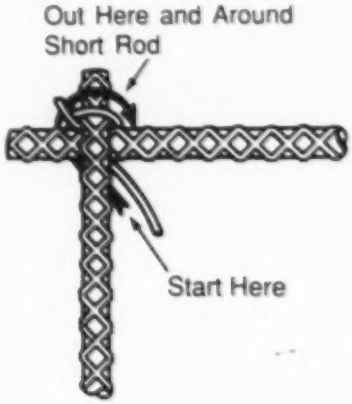
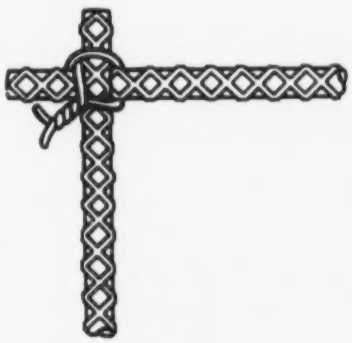



**FIGURE 18**

| | Yes | No |
|---|---|---|
| 9. Grasp both sections of wire with side cutters and twist. | ___ | ___ |
| 10. Cut off long section of wire and make three or four twists in wire; then cut both ends so there will be approximately three-quarters of an inch left; tap ends down with pliers. | ___ | ___ |

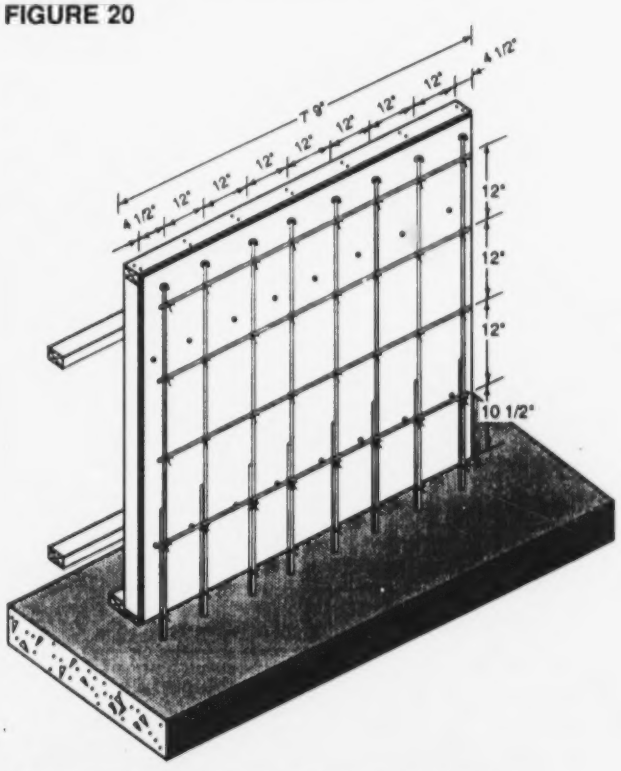
**FIGURE 19**



| | | |
|---|---|---|
| 11. Continue with same procedure until all ties are made on top rod. | ___ | ___ |

| | Yes | No |
|---|---|---|
| 12. Use rule and keel to measure and mark on second rod twelve inches apart starting at four and one half inches in from end of rod; then using same procedure as previously used, continue to tie all rods until steel is all tied. | ___ | ___ |

**FIGURE 20**




| | | |
|---|---|---|
| 13. Use wire ties to attach bolsters to top section of form behind rods. | ___ | ___ |
| 14. This concludes this Job Sheet. Ask your instructor to evaluate your work. | ___ | ___ |

(End of Job Sheet)

## SKILL TEST RECORD

**EVALUATOR'S COMMENTS**

_____

_____

_____

**PRODUCT EVALUATION**

**Evaluator note:** Rate the student on the following criteria by circling the appropriate numbers. Each criterion must receive a rating of "3" or higher to demonstrate student mastery. (See Performance Evaluation Key.) A student who is unable to demonstrate mastery should review the material and submit another product for evaluation.

| Criteria: | | | | |
|---|---|---|---|---|
| Rebar secured to dowels | 4 | 3 | 2 | 1 |
| Horizontal spacing correct (+/- ¼") | 4 | 3 | 2 | 1 |
| Vertical rods cut to length (+/-½") | 4 | 3 | 2 | 1 |
| Vertical rod clearance at 1 ½" (+/-¼") | 4 | 3 | 2 | 1 |
| Rebar secured firmly to vertical bars | 4 | 3 | 2 | 1 |
| Install bolsters | 4 | 3 | 2 | 1 |

**EVALUATOR'S COMMENTS**

_____

_____

_____

**AVERAGE RATING**

**Evaluator note:** To obtain an average rating for the Competency Profile, total the designated points in "Product Evaluation" and divide by the total number of criteria. Circle the rating on the "Performance Evaluation Key" below.

**PERFORMANCE EVALUATION KEY**

4 **Skilled** — Can perform job with no additional training
3 **Moderately Skilled** — Has performed job during training program; limited additional training may be required
2 **Limited Skill** — Has performed job during training program; additional training is required to develop skill
1 **Unskilled** — Is familiar with process, but is unable to perform job

| JOB SHEET 3 | APPLIED SKILLS | A 3 |
|---|---|---|

**OBJECTIVE 7**

**Lay and tie welded wire fabric.**

**EQUIPMENT AND SUPPLIES**

- Eye protection and hard hat
- Gloves
- Side cutters, one paid
- Wire reel and tie wire
- Bolt cutters
- One roll 6 x 6 - W 1.4 x W 1.4 welded wire fabric
- Steel tape

**PROCEDURE**

Functional Reading Skills
- Follow written instructions
- Interpret graphics and symbols

Math Application Skills
- Use English and metric measures

Functional Math Skills
- Make measurements

1. Put on safety equipment.

2. Roll out wire fabric to length desired; cut off; to help fabric lay flatter turn it upside down. ___ ___

**CAUTION:** To avoid injury be sure to stand on both edges of fabric as you cut the fabric. ___ ___

3. Be sure the wire fabric is 3" from form. ___ ___

4. Turn roll and set next to the first strip of wire fabric. ___ ___

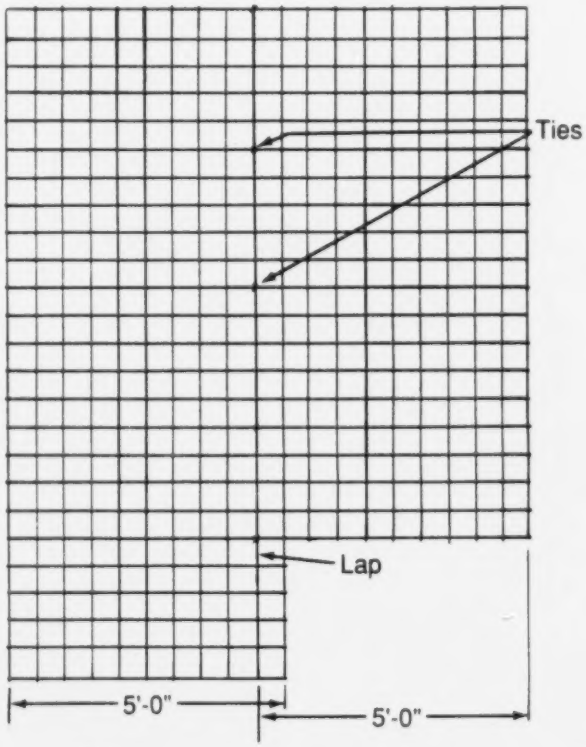
5. Roll out second strip of wire fabric, lapping at least six inches; cut off and turn upside down. ___ ___

Yes No

6. Tie edges of wire that are lapped, using simple tie.

   **NOTE:** Ties every thirty to thirty-six inches should be sufficient.

**FIGURE 21**



| | Yes | No |
|---|---|---|
| 7. This concludes this job sheet. Ask your instructor to evaluate your work. | ___ | ___ |
| 8. Put away all tools and materials. | ___ | ___ |

(End of Job Sheet)

## SKILL TEST RECORD

**EVALUATOR'S COMMENTS**

_____

_____

_____

**PRODUCT EVALUATION**

**Evaluator note:** Rate the student on the following criteria by circling the appropriate numbers. Each criterion must receive a rating of "3" or higher to demonstrate student mastery. (See Performance Evaluation Key.) A student who is unable to demonstrate mastery should review the material and submit another product for evaluation.

| Criteria: | | | | |
|---|---|---|---|---|
| Wire fabric turned upside down | 4 | 3 | 2 | 1 |
| Second strip overlapped 6" (-¼" + 6") | 4 | 3 | 2 | 1 |
| Ties at 36" intervals (+/- 1") | 4 | 3 | 2 | 1 |
| Wire fabric 3" from form (+/-¼ | 4 | 3 | 2 | 1 |

**EVALUATOR'S COMMENTS**

_____

_____

_____

**AVERAGE RATING**

**Evaluator note:** To obtain an average rating for the Competency Profile, total the designated points in "Product Evaluation" and divide by the total number of criteria. Circle the rating on the "Performance Evaluation Key" below.

**PERFORMANCE EVALUATION KEY**

4 **Skilled** – Can perform job with no additional training

3 **Moderately Skilled** – Has performed job during training program; limited additional training may be required

2 **Limited Skill** – Has performed job during training program; additional training is required to develop skill

1 **Unskilled** – Is familiar with process, but is unable to perform job

| WRITTEN TEST | APPLIED SKILLS | A 3 |
|---|---|---|

Name _____ Score _____

OBJECTIVE 1

**Given a list of terms associated with the skills needed to install concrete reinforcing, match them to their correct definition.** Write the letter that corresponds t the most correct answer.

_____ 1. The distance at which reinforcing steel is embedded into the concrete is called

a. position in-cast
b. layered depth
c. concrete coverage
d. concrete sink

_____ 2. Reinforcing bars that connect two separate cast sections of concrete are known as

a. branching rods
b. splice rods
c. bond or stub rods
d. dowels or stub rods

_____ 3. Steel bars or wire embedded in concrete are called

a. reinforcing steel
b. bond grids
c. tensile steel
d. cast embedded steel

_____ 4. A grid of preassembled reinforcing bars is a

a. screed
b. matt
c. embedded bond
d. matrix steel grid

*May be photocopied for student use.*

OBJECTIVE 2

**Choose the basic skills required to install concrete reinforcing.**

_____ 1. To install concrete reinforcing, you must have the skills to

a. make the various types of ties used to secure reinforcing
b. set up ladders and scaffolds properly
c. know and follow safety rules and regulations
d. all the above

_____ 2. A required skill to install concrete reinforcing is to

a. finish a concrete slab
b. operate a power trowel
c. set up and use a cutting torch
d. all the above

_____ 3. It is required to have the skills to install reinforcing steel in

a. footings, walls, columns, and floor slabs
b. footings, curbs, asphalt driveways, and walls
c. walls, floor slabs, suspended ceilings, and columns
d. columns, footings, walls, and asphalt driveways

_____ 4. A required skill to install concrete reinforcing is to

a. use and care for tools properly
b. set screens
c. establish property lines
d. use a miter box properly

*May be photocopied for student use.*

OBJECTIVE 3

**Given a drawing, match reinforcing bar shapes to their purpose.**

_____ 1. The figure below is used primarily to

a. support other reinforcement
b. reinforce a round column
c. build rebar matts
d. support round columns

_____ 2. The figure below is used to

a. reinforce square slabs
b. reinforce round columns
c. build reinforcing matts
d. support other reinforcement such as beams

_____ 3. The figure shown below is used to

a. spiral used for column reinforcement
b. square shaped for column reinforcement
c. assemble a truss or shear
d. support other reinforcement such as beams

*May be photocopied for student use.*

OBJECTIVE 4

**Given choices, select the correct rules to install concrete reinforcing.**

_____ 1. Safety rules require that

a. bars can not be overlapped more than 12 inches
b. rebar caps be placed over any protruding bars
c. incorrectly marked rebars be used
d. reinforcing be tied loosely to allow bars to shift

_____ 2. Rebars should never be lapped less than

a. 48"
b. 24"
c. 12"
d. 6"

_____ 3. Steel must be placed

a. according to specifications
b. based on personal preference
c. only in slab floors
d. anywhere you feel there is a need

_____ 4. Reinforcing steel must be

a. tied loosely
b. clean-free of oil, dust, paint, or scale
c. installed to touch forms
d. coated with form oil before concrete is placed

_____ 5. Steel reinforcement must be placed to

a. touch the edge of forms
b. be overlapped not more than 6"
c. allow it to shift during concrete placement
d. meet the plan for concrete coverage

---

**NOTE:** Objectives 5-7 are evaluated on job sheets sheets in this unit. If you have not completed these components, see your instructor.

*May be photocopied for student use.*

| WRITTEN TEST ANSWERS | APPLIED SKILLS | A 3 |
|---|---|---|
| OBJECTIVE 1 | 1. c | |
| | 2. d | |
| | 3. a | |
| | 4. b | |
| OBJECTIVE 2 | 1. d | |
| | 2. c | |
| | 3. a | |
| | 4. a | |
| OBJECTIVE 3 | 1. c | |
| | 2. b | |
| | 3. d | |
| OBJECTIVE 4 | 1. b | |
| | 2. c | |
| | 3. a | |
| | 4. b | |
| | 5. d | |

# CIMC
# TEST CODE SHEET

**VOCATIONAL PROGRAM (BOOK TITLE)** INTRODUCTION TO CONCRETE REINFORCING

**UNIT NUMBER AND TITLE** – A3 – APPLIED SKILLS

**TOTAL NUMBER OF TEST QUESTIONS** 16

**TOTAL NUMBER OF BASIC SKILL QUESTIONS** 4

| OBJECTIVE NUMBER | TEST QUESTION NUMBER(S) | BASIC SKILL CODE(S) |
|---|---|---|
| 1 | 1-4 | X |
| 2 | 1-4 | E |
| 3 | 1-3 | X |
| 4 | 1-5 | X |
| 5 | Evaluated on Job Sheet 1 | |
| 6 | Evaluated on Job Sheet 2 | |
| 7 | Evaluated on Job Sheet 3 | |
| | | |
| | | |
| | | |
| | | |
| | | |
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| | | |
| | | |

# INTRODUCTION TO CONCRETE REINFORCING
# COMPETENCY PROFILE

Student _____ Soc. Sec. No. ___ – ___ – ____
Last First MI

PROGRAM Grade 9 10 11 12 Adult SCHOOL

INSTRUCTOR SCHOOL ADDRESS PHONE

STUDENT'S HOME ADDRESS DATE OF BIRTH PHONE

STUDENT'S EMPLOYER ADDRESS PHONE

CONTACT IN CASE OF EMERGENCY PHONE

ADDRESS

OR

ADDRESS PHONE

The above information can be used for school records and/or to ensure safety of students. This confidential information is not to be released to employers or to the general public.

## ON-THE-JOB TRAINING/WORK EXPERIENCE

| DURATION OF EMPLOYMENT | JOB TITLE | EMPLOYER | SUPERVISOR'S NAME | ADDRESS OF EMPLOYER | PHONE |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |

This agency does not discriminate on the basis of race, creed, color, national origin, sex, age, veteran status, qualified handicap, or disability.

**Duplicate one copy for each student.**

## SPECIFIC JOB COMPETENCIES

**DIRECTIONS:** Evaluate the trainee using the rating scale below, and check the appropriate number to indicate the degree of competency. The numerical ratings of 4, 3, 2, 1, and 0 are not inte to represent the traditional school grading system of A, B, C, D, and F. The descriptions associated with each of the numbers focus on level of student performance for each of the tasks listed below.

**Rating Scale:**
- 4 — **Skilled** — can perform job independently with no additional training.
- 3 — **Moderately Skilled** — has performed job independently during the training program; limited additional training may be required.
- 2 — **Limited Practice** — has practiced job during training program; additional training is required to develop skill.
- 1 — **Exposure Only** — general information provided with no practice time; close supervision needed and additional training required.
- 0 — **No Exposure** — no information or practice provided during training program; complete training required.

### UNIT A1

| 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|
| | | | | |

*Fundamentals of Reinforcing Materials*

1. Given a list of terms associated with materials used in concrete reinforcing, match them to their correct definitions.
2. Interpret the numeric identity for common sizes of welded wire fabric rolls and sheets.
3. Given illustrations, select the titles of hardware accessories used to install reinforcing bars.
4. Given drawings, match reinforcing bar supports to their proper titles.
5. Given drawings with identification markings, write in the specifications of standard reinforcing bars.
6. _____

WRITTEN TEST SCORE _____

### UNIT A2

| 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|
| | | | | |

*Concrete Reinforcing Tools*

1. Given a list of terms associated with tools used in concrete reinforcing, match them to their correct definitions.
2. Choose the correct guidelines for the safe use and care of concrete reinforcing tools.
3. Given illustrations, select the correct titles of concrete reinforcing tools.
4. _____

WRITTEN TEST SCORE _____

### UNIT A3

| 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|
| | | | | |

*Applied Skills*

1. Given a list of terms associated with the skills needed to install concrete reinforcing, match them to their correct definitions.
2. Choose the basic skills required to install concrete reinforcing.
3. Given drawings, match reinforcing bar shapes to their purposes.
4. Given choices, select the correct rules to install concrete reinforcing.
5. Install reinforcing bars for a footing.
6. Install reinforcing bars in a wall.
7. Lay and be welded wire fabric.
8. _____

WRITTEN TEST SCORE _____

**Use of This Document**

Use of this document can be used to record information about the student and the skills mastered by the student. This information is useful in documenting student progress during the training program and to provide information about the student's qualifications to potential employers and for entry into advanced training programs. Instructors using AGC-CIMC instructional materials are authorized to reproduce this document as required for use in their training programs.

# INTRODUCTION TO CONCRETE REINFORCING

CIMC

CIM

## READING SKILLS

WRIT

| UNITS OF INSTRUCTION | Reading Comprehension | | | | | | | | Research and Reference | | | | | | | | Functional Reading | | | | | | | | Language | | Composition | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Gain factual information | Distinguish fact, opinion and inference | Recognize stereotyping and bias | Recognize propaganda | Analyze cause and effect | Draw conclusions | Make generalizations | React to written material | Apply word analysis techniques | Select useful resources | Locate resources | Find materials in library | Use standard references | Use in-book reference tools | Use audiovisual media | Use computer data base | Use magazines and newspapers | Interpret forms and records | Follow written instructions | Interpret graphics and symbols | Use content area vocabulary | Interpret abbreviations/acronyms | Read aloud | Use standard grammar and correct spelling, punctuation, and capitalization | State ideas clearly | Use complete sentences | Develop preliminary outline | Use topic sentences | Use introductory/closing paragraphs | Compose reports | Compose essays | Proofread and edit | Construct graphics and symbols |
| 1 Concrete Reinforcing Materials | | | | | | | | | | | | | | | | | | | | ● | | | | | | | | | | | | |
| 2 Concrete Reinforcing Tools | | | | | | | | | | | | | | | | | | | | ● | | | | | | | | | | | | |
| 3 Concrete Reinforcing Applied Skills | | | | | | | | | | | | | | | | | | ● | | ● | | | | | | | | | | | | |

# C BASIC SKILLS DOCUMENTATION MATRI

## 'ING SKILLS

## MATH SKILLS

| Research | | | | | Functional Writing | | | | | | | Operation and Calculation | | | | | | | | | | Math Application | | | | | | | | | | Data Analysis and Display | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Take notes | Use notecards | Create bibliography | Use footnotes | Outline material | Complete forms and records | Write instructions | Write letters | Write job applications | Write resumes | Use word processing | Use computer graphics | Round off numbers | Estimate answers | Use scientific notations | Use exponential notations | Calculate with whole numbers | Calculate with fractions | Calculate with decimals | Convert whole numbers to fractions | Convert whole numbers to decimals | Solve numerical expressions | Solve formulae and equations | Obtain squares and square roots | Convert units of measure | Perform metric calculations | Solve word problems | Select/apply mathematical formula | Select/apply mathematical procedure | Use English and metric measures | Solve time/rate/distance problems | Solve ratio/proportion problems | Solve percent problems | Apply techniques of scaling | Apply algebra principles | Apply geometry principles | Apply trigonometry principles | Interpret charts and tables | Interpret graphs (type) | Collect /record data | Apply sampling techniques | Apply principles of probability | Construct charts and tables | Construct graphs | Calculate statistics | Interpret statistics | Interpret blueprints/plans | Make measurements |
| | | | | | ● | | | | | | | | | | | ● | ● | | | | | ● | | | | | | | | ● | | | | | | | | | | | | | | | | | |
| | | | | | ● | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

# SCIENCE SKILLS

94-010744

| Functional Math | General Science | Life Science | Physical Science | Earth Science |
|---|---|---|---|---|
| Solve practical problems | Apply computing skills | Identify/classify living organisms | Analyze/classify matter | Investigate physical characteristics of the earth |
| Calculate gross earnings | Apply scientific method of inquiry | Investigate biological history of the earth | Investigate forms/changes of matter | Investigate geological history of the earth |
| Solve income/expense problems | Conduct experiments | Investigate food chains, webs, pyramids | Investigate forms/changes of energy | Investigate physical forces acting on the earth |
| Prepare a budget | Investigate science ethics | Investigate/apply principles of human development | Investigate/apply chemical properties | Solve problems of longitude, latitude, and time zones |
| Calculate interest | Investigate science history | Investigate/apply principles of genetics/heredity | Investigate/apply physical laws | Investigate conservation of physical resources |
| Solve interest problems | Investigate/apply economics in technology | Investigate/apply principles of anatomy/physiology | | Investigate conservation of living resources |
| Calculate sales tax | Use scientific instruments | Investigate health issues | | Investigate issues of environmental impact |
| Determine income tax | Investigate/apply technology | | | Apply science principles to environmental issues |
| Use calculator for computation | Collect specimens | | | |
| Use computer for computation | | | | |
| Use computer spreadsheets | | | | |

CIMC

## ORAL COMMUNICATION SKILLS

IN

| | Oral Presentation | | | | | | | | | | Listening | | | | Interactive Communication | | | | | | | | General Relating | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **UNITS OF INSTRUCTION** | Make informative presentations | Make persuasive presentations | Present personal opinion/viewpoint | Use good speaking techniques | Select/use words effectively | Use effective body language | Present approriate appearance | Integrate audio and/or visual materials in oral presentations | Adapt presentation to specific audience | Apply active listening skills | Distinguish fact, opinion, and inference | Draw conclusions/make generalizations | Analyze/identify point of view | Give/follow oral directions | Apply questioning techniques | Conduct/receive interviews | Analyze/apply nonverbal communication | Work effectively in a group | Communicate with clients/customers/patients | Communicate with co-workers | Communicate with supervisors | Communicate with professional colleagues/ associates | Apply telephone etiquette | Investigate/apply communication process models | Analyze/apply nonverbal communication | Investigate/apply cross-cultural communication | Interact with co-workers | Interact with supervisors | Interact with clients/customers/patients | Interact with professionalcolleagues/associates | Interact with family/friends | Participate in group activities | Participate in industrial relations/functions | Identify personal values/attitudes | Apply information to life experiences |
| 1 Concrete Reinforcing Materials | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 Concrete Reinforcing Tools | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 Concrete Reinforcing Applied Skills | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|

## TERPERSONAL OR RELATING SKILLS

### Teamwork/ Cooperation

- Identify values/attitudes
- Identify needs/drives
- Select/apply appropriate behavior
- Investigate/identify personal styles
- Investigate/identify group/corporate climate
- Give/receive feedback
- Identify hidden purposes
- Investigate/apply group dynamics
- Control undesirable/inappropriate behavior
- Resolve conflicts
- Clarify goals/objectives
- Devise "win/win" situations
- Build consensus
- Generate ideas
- Present point of view

### Leadership/ Influence

- Analyze/apply leadership styles
- Analyze/apply management styles
- Obtain confidence of others
- Develop esteem in self/others
- Persuade others
- Analyze/apply motivation techniques
- Provide positive coaching

## CREATIVE THINKING/ PROBLEM SOLVING SKILLS

### Cognitive Activities

- Collect/record information
- Identify critical elements/issues
- Define a problem
- Identify underlying causes
- Apply a problem-solving model
- Analyze/synthesize information
- Identify/analyze underlying assumptions
- Draw conclusions
- Predict results/outcomes
- Identify/evaluate consequences
- Identify/develop alternatives
- Evaluate alternatives
- Select an alternative
- Devise a solution
- Create a finished product
- Apply intuitive/creative thinking processes
- Transfer knowledge/training to new situations
- Apply new technology
- Develop an action plan
- Evaluate results/outcomes

## EMPLOYA

### Job Search/ Selection

- Analyze personal occupational aptitudes/preferences
- Investigate employment prospects of a career field/occupation
- Investigate training requirements for a career field/occupation
- Investigate benefits of a career field/occupation
- Compare/evaluate career options
- Develop personal career path
- Locate appropriate jobs
- Analyze duties/requirements/benefits of specific job
- Master specific job task/procedure
- Fill in job related applications
- Write letter of application

*est Competency-Based Instructional Systems for Vocational Ed*

## OYABILITY SKILLS

## SOCIAL STUDIES SKILLS

| Job Aquisition/ Development | | | | | | | | | | | Information Analysis | | | | | Social Studies Application | | | | | | | | | | Functional Social Studies | | | | | | | | | | |